065037

FLOOD INSURANCE STUDY

CITY OF LAFAYETTE, CALIFORNIA
CONTRA COSTA COUNTY

SEPTEMBER 16, 1980

federal emergency management agency
federal insurance administration

COMMUNITY NUMBER - 065037

FEMA 209

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Purpose of Study	1
1.2	Coordination	1
1.3	Authority and Acknowledgments	1
2.0	AREA STUDIED	2
2.1	Scope of Study	2
2.2	Community Description	2
2.3	Principal Flood Problems	4
2.4	Flood Protection Measures	5
3.0	ENGINEERING METHODS	5
3.1	Hydrologic Analyses	5
3.2	Hydraulic Analyses	6
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	8
4.1	Flood Boundaries	9
4.2	Floodways	9
5.0	INSURANCE APPLICATION	16
5.1	Reach Determinations	16
5.2	Flood Hazard Factors	16
5.3	Flood Insurance Zones	20
5.4	Flood Insurance Rate Map Description	21
6.0	OTHER STUDIES	21
7.0	LOCATION OF DATA	21
8.0	BIBLIOGRAPHY AND REFERENCES	21

TABLE OF CONTENTS (Cont'd)

Page

FIGURES

Figure 1 - Vicinity Map..... 3
Figure 2 - Floodway Schematic..... 10

TABLES

Table 1 - Summary of Discharges..... 7
Table 2 - Floodway Data..... 11
Table 3 - Flood Insurance Zone Data..... 17

EXHIBITS

Exhibit 1 - Flood Profiles

North Branch Reliez Creek	Panel 01P
Reliez Creek	Panels 02P-05P
Happy Valley Creek	Panels 06P-08P
Hidden Valley Creek	Panel 09P
Lafayette Creek	Panels 10P-12P
Jonas Hill Creek	Panels 13P-14P
Las Trampas Creek	Panels 15P-22P
Grizzly Creek	Panels 23P-25P

Exhibit 2 - Flood Boundary and Floodway Map Index
Flood Boundary and Floodway Maps

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Maps

FLOOD INSURANCE STUDY

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the City of Lafayette, Contra Costa County, California, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Lafayette to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

Streams requiring detailed study were identified at the initial community meeting held on May 12, 1976. The meeting was attended by representatives of the Federal Insurance Administration, the City of Lafayette, and the study contractor.

Contact was made with the Contra Costa County Flood Control and Water Conservation District and the U.S. Geological Survey for additional information on flooding problems and past studies.

A final community meeting was held on May 24, 1979, to present preliminary results of the study. The meeting was attended by representatives of the Federal Insurance Administration, the City of Lafayette, the Contra Costa County Flood Control District, and the study contractor. No problems were raised at this meeting.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by Tudor Engineering Company, for the Federal Insurance Administration, under Contract No. H-4033. This work, which was completed in October 1979, covered all significant flooding sources affecting the City of Lafayette.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of Lafayette, Contra Costa County, California. The area of study is shown on the Vicinity Map (Figure 1).

Detailed methods were used to study North Branch Reliez Creek, Reliez Creek, Happy Valley Creek, Hidden Valley Creek, Lafayette Creek, Jonas Hill Creek, Las Trampas Creek, and Grizzly Creek. There were no areas studied by approximate methods.

Those areas studied by detailed methods were chosen with consideration given to all proposed construction and forecasted development through 1984.

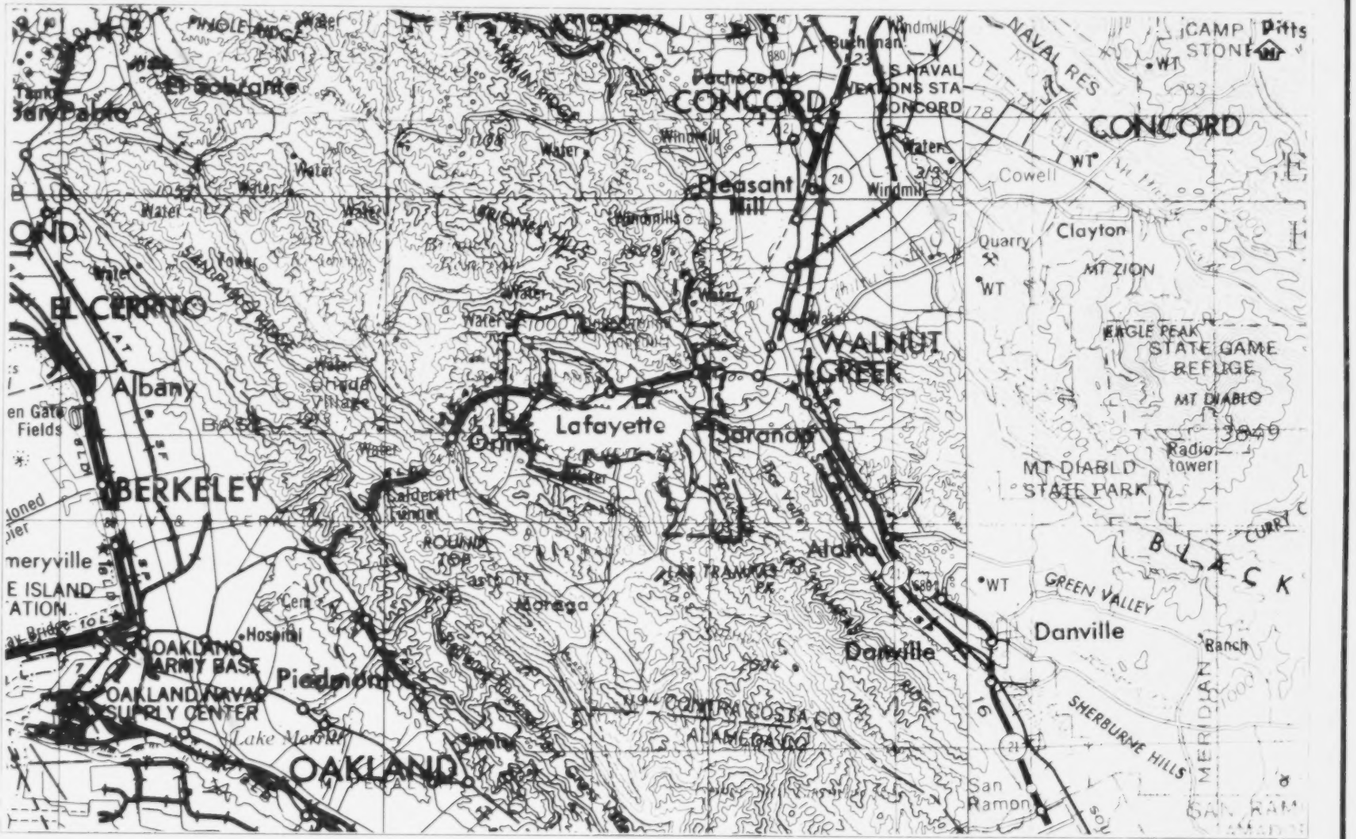
2.2 Community Description

Lafayette is in central Contra Costa County, in west-central California, approximately 20 miles northeast of the City of San Francisco. Lafayette is bordered by the City of Walnut Creek to the east, the Town of Moraga to the south, and unincorporated areas of Contra Costa County.

Lafayette originated in 1847, when Elam Brown purchased the Rancho Acalanes. A hotel was built in 1853 and Brown opened a grist mill. The early economy of the community was largely dependent on redwood lumber camps in the area. As the forests were depleted and lumbering disappeared, Lafayette turned to agricultural development (Reference 1). The City of Lafayette was incorporated on July 22, 1968, and has become a predominantly residential suburb of the Cities of Oakland and San Francisco. In 1975, the population of Lafayette was 19,628 (Reference 2).

Lafayette is in the Las Trampas Creek drainage basin, a subbasin of Pacheco Creek, which discharges into Suisun Bay. The upper parts of the streams flow through steep, V-shaped canyons, where trees and shrubs line the channels, and grasses cover the hillsides. The lower parts of the streams flow through small, gently sloping valleys with substantial residential development, extending, in some cases, up to the streambanks. Elevations range from approximately 1100 feet along Lafayette Ridge to approximately 225 feet at lower Las Trampas Creek.

In general, the streams in Lafayette drain from west to east. The main branch of this drainage system is Las Trampas Creek. Las Trampas Creek flows northerly through southern Lafayette, takes a sharp northeasterly bend near the intersection of Moraga Road and Mt. Diablo Boulevard, and then flows southeasterly to its confluence with Walnut Creek just outside the easternmost


CONCORD
Pleasant Hill
WALNUT CREEK
Lafayette
Orinda
Moraga
Alamo
Danville
San Ramon
BERKELEY
OAKLAND
Albany
EL CERRITO
Piedmont
OAKLAND ARMY BASE
OAKLAND NAVAL SUPPLY CENTER
Lake Merritt
CONTRA COSTA CO
ALAMEDA CO
CAMP STONE
NAVAL RES
Clayton
MT ZION
EAGLE PEAK
STATE GAME REFUGE
MT DIABLO
MT DIABLO STATE PARK
Radio tower
Cowell
Quarry
GREEN VALLEY
Ranch
SHERBURNE HILLS
MERIDIAN
BLACK
CURRY C
Pinole Ridge
Briones Ridge
Orinda Village
Caldecott Tunnel
ROUND TOP
Las Trampas Ridge
Diablo Valley
Hospital
Water
Windmill
Power
Tank
Pacheco
Buchanan Field
S NAVAL WEAPONS STA CONCORD
Pitts
WT
Waters
Windmills
Sobrante
San Pablo
Fields
Gate
Berkeley
Meryville
E ISLAND
ATION
Ridge
Valley
Creek
Trail
Tunnel
Bridge
Toll
Ave
Blvd
Dr
Rd
Hwy
Sta
Res
Pk
Co
Mt
Ln
Ct
Pl
Cir
Ter
Sq
Ctr
Ranch
Fields
Gate
Berkeley
Meryville
E ISLAND
ATION
Bridge
Toll
Ridge
Valley
Creek
Trail
Tunnel

corporate limits of Lafayette. Grizzly Creek joins Las Trampas Creek from the southeast near the intersection of North Silverado Drive and St. Marys Road. Jonas Hill Creek joins Las Trampas Creek from the southwest, east of the intersection of First Street and Monroe Avenue. Happy Valley Creek joins Lafayette Creek from the northwest, approximately 2100 feet west of its confluence with Las Trampas Creek. Hidden Valley Creek joins Lafayette Creek from the west just northeast of the intersection of Mt. Diablo Boulevard and El Nido Ranch Road. Reliez Creek is joined from the north by North Branch Reliez Creek near the northernmost corporate limits, and then flows southeasterly to its confluence with Las Trampas Creek near the easternmost corporate limits of Lafayette.

The climate of Lafayette is characterized by cool, wet winters and hot, dry summers. The average annual precipitation is approximately 28 inches. Most of the rainfall occurs between October and April. The average annual temperature is 56°F, with average daily temperatures ranging from 45°F in January to 68°F in September (Reference 3).

The upland areas are dominated by loamy and sandy soils developed primarily from sedimentary rock. The soil is shallow to moderately deep with good to extremely good natural drainage. The lower valley areas are dominated by very deep, moderately fine-textured and fine-textured soils which are well drained to moderately well drained (Reference 4).

2.3 Principal Flood Problems

Flooding in Lafayette is caused primarily by winter rains. Severe flooding occurred in 1955, 1958, and 1963. These floods have an estimated return interval of 20 to 30 years. The greatest flood damage in Lafayette resulted from the 1958 flood, when 42.8 inches of rainfall were recorded during an 8-day period, in March and April.

Areas of the city severely damaged by floods in the past include land adjacent to Happy Valley Creek, Lafayette Creek, and Jonas Hill Creek. Lesser flood damage has occurred along several of the small streams, particularly along tributaries to Happy Valley Creek and Lafayette Creek.

Most of the 100-year flows are contained within the channels of the streams. Overflow, mostly in the form of sheet flow, will occur along roads and in some overbank areas due to inadequate culvert capacities along Happy Valley, Hidden Valley, Lafayette, and Grizzly Creeks.

2.4 Flood Protection Measures

Flood protection measures in Lafayette are limited to channel improvements on one part of Lafayette Creek. In 1956, a length of approximately 2000 feet of Lafayette Creek was channelized between Moraga Road and Third Street. The rectangular, concrete-lined channel will contain the 50-year flow, but not the 100-year or 500-year flows.

There is no flood plain management in Lafayette.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual occurrence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the community.

Since there are no gaging stations on the streams draining Lafayette, peak discharges were based on a regional regression analysis developed by the study contractor for the Central-Delta region of Contra Costa County. In accordance with U.S. Water Resources Council procedures (Reference 5), a peak discharge-frequency relationship was established from the records of 15 stream gages containing 278 measured annual flood peaks (Reference 6). These gages, which include gages located on adjacent Walnut Creek and San Ramon Creek, depict drainage basins hydrologically similar to those in Lafayette. A stepwise multiple regression was then used to transfer the relationships developed for the gaging stations to the ungaged basins

in Lafayette. Where appropriate, peak discharges were increased to reflect the effects of urbanization within Lafayette. These adjustments were based on the proportion of the tributary basin which has been developed and channelized.

Peak discharge-drainage area relationships for North Branch Reliez Creek, Reliez Creek, Happy Valley Creek, Hidden Valley Creek, Lafayette Creek, Jonas Hill Creek, Las Trampas Creek, and Grizzly Creek are shown in Table 1.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of streams in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each stream studied in the community.

Water-surface elevations for all streams studied in detail, except North Branch Reliez Creek, were computed using the U.S. Army Corps of Engineering HEC-2 step-backwater program (Reference 7), supplemented by hand calculations and a special computer program developed by the study contractor (Reference 8). Most culverts were analyzed using this special computer program, which calculated a headwater elevation to be used in continuing the backwater analysis. North Branch Reliez Creek water-surface elevations were obtained from normal-depth calculations. It was determined that all flows for North Branch Reliez Creek will be contained in the channel.

Cross sections for backwater analyses were located short distances upstream and downstream of bridges and other hydraulically significant features, in order to establish the backwater effect of such features.

Cross section locations and overbank ground elevations were obtained from topographic maps at a scale of 1:3600 with a contour interval of 2 feet (Reference 9). Underwater data were obtained from field measurements made by the U.S. Geological Survey in 1972.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness factors (Manning's "n") used in the hydraulic computations were assigned on the basis of field inspection of flood plain areas. The values used for the channel and overbank areas were as follows:

Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
North Branch Reliez Creek					
At Mouth	0.2	60	100	110	150
Reliez Creek					
At Condit Road	3.6	700	1,300	1,500	1,900
At Springhill Court	0.9	200	350	400	560
Happy Valley Creek					
At State Highway 24	2.3	600	1,070	1,230	1,580
At Happy Valley Road	1.8	480	830	950	1,200
Hidden Valley Creek					
At El Nido Ranch Road	1.8	600	1,020	1,120	1,400
At Corporate Limits	0.2	80	130	140	170
Lafayette Creek[1]					
At Third Street	5.6	1,500	2,700	3,100	4,000
At Moraga Road	2.9	880	1,520	1,740	2,200
Jonas Hill Creek					
At Monroe Avenue	1.0	310	540	590	730
Las Trampas Creek					
At Freeman Road	20.0	3,800	7,300	8,700	11,300
At Fourth Street	15.1	3,300	6,200	7,000	9,000
At Paradise Court	8.5	1,560	3,000	3,600	4,800
Upstream of Grizzly Creek Confluence	5.3	1,100	2,100	2,400	3,200
At Corporate Limits	2.6	580	1,080	1,240	1,630
Grizzly Creek					
At Confluence With Las Trampas Creek	1.9	400	740	850	1,170

[1]Does Not Include 1.2 Square Miles of Drainage Controlled by Lafayette Reservoir

Manning's "n"

Stream	Channel	Overbank
Reliez Creek	0.035-0.055	0.060
Happy Valley Creek	0.040-0.065	0.060-0.070
Hidden Valley Creek	0.040-0.050	0.060
Lafayette Creek	0.022-0.060	0.065-0.070
Jonas Hill Creek	0.025-0.055	0.060
Las Trampas Creek	0.030-0.070	0.050-0.100
Grizzly Creek	0.030-0.060	0.060

Starting water-surface elevations were determined for the streams in Lafayette using four methods. Normal-depth calculations were used for North Branch Reliez Creek. For Reliez Creek, Happy Valley Creek, Lafayette Creek, Jonas Hill Creek, and Grizzly Creek, the slope-area method was used. The headwater elevation calculated in the culvert analysis was used for Hidden Valley Creek. The starting water-surface elevation for Las Trampas Creek was taken from the backwater analysis of that stream for the Contra Costa County Flood Insurance Study (Reference 10).

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

The hydraulic analyses for this study were based on unobstructed flow. Therefore, the flood elevations shown on the profiles may be considered valid only if hydraulic structures remain unobstructed and operate properly.

Some of the culverts on Happy Valley Creek, Hidden Valley Creek, Lafayette Creek, and Grizzly Creek will not contain the 100-year flows. The result will be shallow flooding above these culverts and/or along the roads. Shallow flooding depths were determined from critical-depth calculations, using the overflow discharge given by the backwater analysis (Reference 7). Shallow flooding elevations were taken from the backwater analysis.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage State and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:3600, with a contour interval of 2 feet (Reference 9).

For stream channels designated "Zone A Contained in Channel", the 100-year flood boundaries are based on the existing channel alinement and right-of-way.

Shallow flood boundaries were delineated using the appropriate depths and elevations on the previously mentioned topographic maps (Reference 9).

Flood boundaries for the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year flood boundary has been shown. Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity and increases flood heights, thus increasing flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment in order that the 100-year flood be carried without substantial increases in flood heights. As minimum standards, the Federal Insurance Administration limits such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

The floodways in this study were computed on the basis of equal-conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

For the entire lengths of Reliez and Grizzly Creeks and portions of Las Trampas Creek, the floodway is contained in the channel and no Flood Boundary and Floodway Map (Exhibit 2) has been prepared; therefore, cross sections are not presented for these areas on Table 2.

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year flood boundaries are close together, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

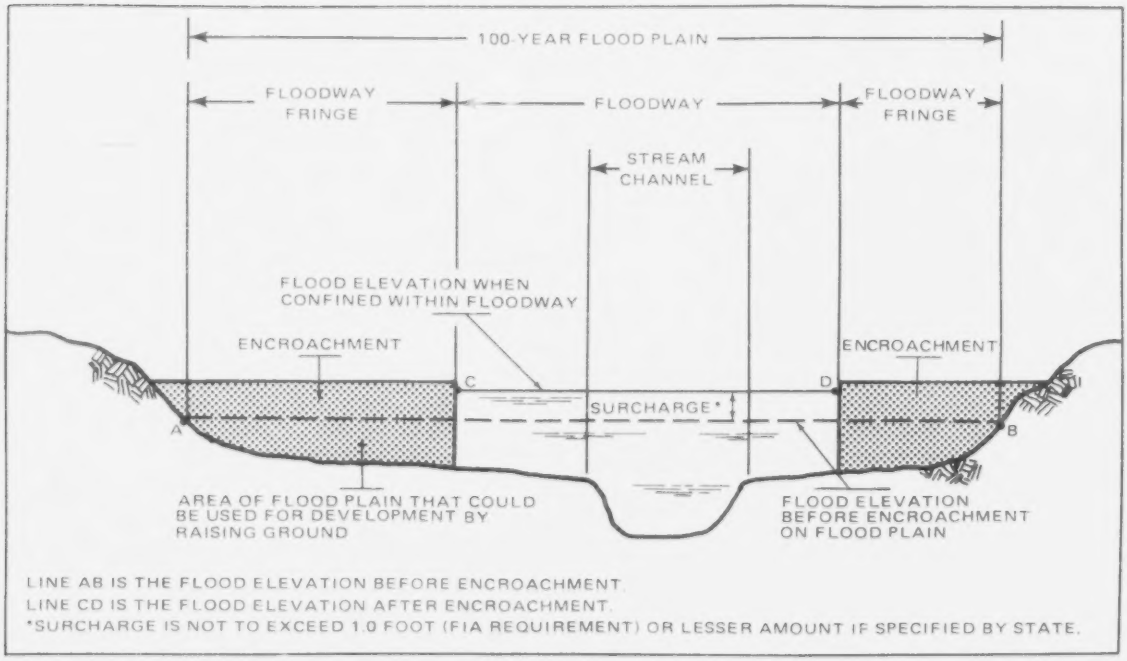

100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 2. Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Happy Valley Creek								
A	740	37	134	9.2	294.5	294.5	294.5	0.0
B	1,775	44	486	2.5	317.8	317.8	317.8	0.0
C	2,095	100	599	2.1	325.4	325.4	325.4	0.0
D	3,225	72	534	2.3	342.4	342.4	342.4	0.0
E	4,785	35	197	6.2	361.5	361.5	361.5	0.0
F	5,555	51	129	9.6	379.5	379.5	379.5	0.0
G	6,115	48	128	9.6	394.0	394.0	394.0	0.0
H	7,295	41	104	9.2	422.4	422.4	422.4	0.0
I	8,830	59	241	3.9	458.8	458.8	458.8	0.0
J	9,685	17	85	11.2	469.6	469.6	469.6	0.0
K	10,975	38	128	7.4	496.2	496.2	496.2	0.0
L	12,085	24	56	8.9	528.5	528.5	528.5	0.0
M	14,290	17	36	8.3	582.2	582.2	592.2	0.0
Hidden Valley Creek								
A	3,725	75	1169	1.0	463.1	463.1	463.1	0.0
B	4,240	43	353	3.2	463.1	463.1	463.1	0.0
C	5,355	15	59	11.4	497.9	497.9	497.9	0.0
D	6,190	49	88	7.6	523.8	523.8	523.8	0.0

[1]Feet Above Confluence With Lafayette Creek

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOODWAY DATA

HAPPY VALLEY CREEK-HIDDEN VALLEY CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Lafayette Creek								
A	230	51	392	7.9	266.7	263.0[2]	263.0[2]	0.0
B	710	39	259	12.0	266.7	266.7	266.7	0.0
C	850	33	370	8.4	273.5	273.5	273.5	0.0
D	1,635	45	238	13.0	275.4	275.4	275.5	0.1
E	2,120	108	447	6.9	282.8	282.8	283.0	0.2
F	2,705	31	223	7.8	287.0	287.0	287.2	0.2
G	3,650	31	148	11.8	292.5	292.5	292.6	0.1
H	3,840	10	142	12.3	300.7	300.7	300.7	0.0
I	5,300	54	211	8.2	308.7	308.7	309.5	0.8
J	5,630	52	286	6.1	312.2	312.2	312.2	0.0
K	6,740	69	360	4.8	319.8	319.8	319.8	0.0
L	7,110	49	204	8.5	321.1	321.1	321.1	0.0
M	7,840	38	249	7.0	326.9	326.9	326.9	0.0
N	8,070	39	154	11.3	330.4	330.4	330.4	0.0
O	8,840	51	168	10.4	340.8	340.8	340.8	0.0
P	9,605	37	193	9.0	350.0	350.0	350.0	0.0
Q	10,085	53	387	4.5	359.0	359.0	359.0	0.0
R	10,265	40	416	4.2	359.3	359.3	359.3	0.0
S	10,725	43	159	11.0	364.4	364.4	364.4	0.0
T	11,170	58	415	2.7	367.7	367.7	367.7	0.0

[1] Feet Above Confluence With Las Trampas Creek

[2] Elevation Computed Without Consideration of Backwater Effect From Las Trampas Creek

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOODWAY DATA

LAFAYETTE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE [1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Jonas Hill Creek								
A	610	12	76	7.7	281.2	281.2	281.3	0.1
B	1,260	18	67	8.8	288.4	288.4	289.1	0.7
C	1,385	23	92	6.4	291.8	291.8	291.8	0.0
D	1,855	18	87	6.8	295.4	295.4	295.7	0.3
E	2,425	15	63	9.4	304.5	304.5	304.9	0.4
F	2,775	23	89	6.6	309.2	309.2	309.2	0.0
G	3,200	21	61	9.7	314.2	314.2	314.2	0.0
H	3,935	16	55	10.7	331.6	331.6	331.6	0.0
I	4,750	15	42	9.7	354.0	354.0	354.0	0.0
J	4,990	72	203	2.0	360.9	360.9	360.9	0.0
K	5,995	9	36	11.4	389.5	389.5	389.6	0.1
L	6,495	37	48	8.8	401.1	401.1	401.1	0.0

[1] Feet Above Confluence With Las Trampas Creek

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOODWAY DATA

JONAS HILL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Las Trampas Creek								
A[2]								
B[2]								
C[2]								
D[2]								
E	17,144	71	627	12.0	222.1	222.1	222.1	0.0
F	17,654	77	727	10.3	225.8	225.8	225.8	0.0
G	19,024	64	752	10.0	231.9	231.9	231.9	0.0
H	19,799	73	773	9.7	233.9	233.9	233.9	0.0
I	20,304	84	779	9.6	236.4	236.4	236.4	0.0
J	20,989	92	1,165	6.4	251.8	251.8	251.9	0.1
K	22,509	81	818	9.2	254.4	254.4	254.5	0.1
L	23,309	77	905	8.3	257.2	257.2	257.2	0.0
M	23,719	77	813	5.3	266.8	266.8	267.1	0.3
N	24,769	51	495	8.7	269.3	269.3	269.4	0.1
O	25,824	67	593	6.1	277.0	277.0	277.0	0.0
P	27,414	60	572	6.3	292.1	292.1	292.1	0.0
Q	28,084	65	505	6.4	294.5	294.5	294.5	0.0
R	28,584	53	408	8.8	302.0	302.0	302.0	0.0
S	28,884	59	500	7.2	304.2	304.2	304.2	0.0
T	29,714	73	519	6.9	307.6	307.6	307.6	0.0
U	31,509	54	510	7.1	318.9	318.9	318.9	0.0
V	32,274	85	676	5.3	321.4	321.4	321.4	0.0
W	32,939	40	356	10.1	326.9	326.9	326.9	0.0
X	33,644	77	382	9.4	332.0	332.0	332.0	0.0
Y	34,494	56	424	8.5	337.0	337.0	337.0	0.0
Z	35,314	62	517	7.0	346.2	346.2	346.2	0.0
AA	36,379	40	354	10.2	355.2	355.2	355.2	0.0

[1]Feet Above Confluence With Walnut Creek [2]Data Not Applicable; Floodway Contained In Channel

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOODWAY DATA

LAS TRAMPAS CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Las Trampas Creek (Cont'd)								
AB	37,309	53	578	6.2	359.1	359.1	359.1	0.0
AC	37,889	69	479	7.5	361.3	361.3	361.3	0.0
AD[2]								
AE[2]								
AF	39,789	53	353	6.8	382.1	382.1	382.1	0.0
AG	40,589	61	412	5.8	386.1	386.1	386.1	0.0
AH[2]								
AI[2]								
AJ[2]								
AK[2]								
AL[2]								
AM[2]								

[1]Feet Above Confluence With Walnut Creek [2]Data Not Applicable; Floodway Contained In Channel

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOODWAY DATA

LAS TRAMPAS CREEK

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting Lafayette.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding sources of Lafayette are shown on the Flood Profiles (Exhibit 1) and summarized in Table 3.

No reach determinations were made for North Branch Reliez Creek, since it is designated "Zone A Contained in Channel." Reach determinations, which are made for insurance purposes, have no relevance in a defined channel. Therefore, North Branch Reliez Creek is not included in Table 3.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is the Federal Insurance Administration device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Reliez Creek							
Reach 1	0006,0009	-2.9	-0.6	1.3	030	A6	Varies - See Map
Reach 2	0002,0005						
	0006	-2.0	-0.5	2.1	020	A4	Varies - See Map
Reach 3	0002	-0.6	-0.1	0.4	005	A1	Varies - See Map
Happy Valley Creek							
Reach 1	0005	-2.2	-0.2	0.4	020	A4	Varies - See Map
Reach 2	0005	-4.6	-0.4	0.7	045	A9	Varies - See Map
Reach 3	0005	-10.0	-3.0	1.2	100	A20	342
Reach 4	0005	-4.3	-0.5	0.9	045	A9	Varies - See Map
Reach 5	0004,0005	-2.1	-0.5	1.1	020	A4	Varies - See Map
Reach 6	0004	-2.3	-0.4	0.9	025	A5	Varies - See Map
Reach 7	0001,0004	-1.4	-0.2	0.3	015	A3	Varies - See Map
Shallow Flooding	0005	N/A	N/A	N/A	N/A	A0	Depth 2

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOOD INSURANCE ZONE DATA

RELIEZ CREEK-HAPPY VALLEY CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Hidden Valley Creek							
Reach 1	0004	-1.5	-0.2	1.0	015	A3	438
Reach 2	0004	-0.8	-0.1	0.2	010	A2	Varies - See Map
Reach 3	0004	-6.2	-0.1	0.2	060	A12	Varies - See Map
Reach 4	0004	-1.5	-0.2	0.6	015	A3	Varies - See Map
Shallow Flooding	0004	N/A	N/A	N/A	N/A	AH	438
Shallow Flooding	0004	N/A	N/A	N/A	N/A	AO	Varies - See Map
Lafayette Creek							
Reach 1	0005	-3.3	-0.4	1.1	035	A7	Varies - See Map
Reach 2	0005	-5.3	-0.5	0.7	055	A11	Varies - See Map
Reach 3	0004,0005	-2.2	-0.4	0.8	020	A4	Varies - See Map
Shallow Flooding	0005	N/A	N/A	N/A	N/A	AO	Varies - See Map

[1] Flood Insurance Rate Map Panel [2] Weighted Average [3] Rounded to Nearest Foot

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOOD INSURANCE ZONE DATA

HIDDEN VALLEY CREEK-LAFAYETTE CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Jonas Hill Creek							
Reach 1	0005	-6.5	-0.8	0.5	065	A13	281
Reach 2	0005	-5.0	-0.2	0.5	050	A10	281
Reach 3	0005,0008	-0.5	-0.1	0.3	005	A1	Varies - See Map
Reach 4	0008	-2.0	-0.2	0.6	020	A4	Varies - See Map
Reach 5	0008	-0.7	-0.1	0.4	005	A1	Varies - See Map
Las Trampas Creek							
Reach 1	0005,0006						
	0008,0009	-4.9	-1.0	1.9	050	A10	Varies - See Map
Reach 2	0008,0009						
	0010	-3.2	-0.7	1.4	030	A6	Varies - See Map
Grizzly Creek							
Reach 1	0008,0009						
	0011	-2.2	-0.4	1.1	020	A4	Varies - see Map
Reach 2	0011	-4.9	-1.3	1.4	050	A10	Varies - See Map
Reach 3	0011	-1.0	-0.2	0.6	010	A2	Varies - See Map

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOOD INSURANCE ZONE DATA

JONAS HILL CREEK-LAS TRAMPAS CREEK-GRIZZLY CREEK

Flood Hazard Factors are derived from standard reach determinations. Therefore, they do not apply to channels designated "Zone A Contained in Channel."

5.3 Flood Insurance Zones

After the determination of reaches and their respective Flood Hazard Factors, the entire incorporated area of the City of Lafayette was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone AO:	Special Flood Hazard Areas inundated by types of 100-year shallow flooding where depths are between 1.0 and 3.0 feet; depths are shown, but no Flood Hazard Factors are determined.
Zone AH:	Special Flood Hazard Areas inundated by types of 100-year shallow flooding where depths are between 1.0 and 3.0 feet; base flood elevations are shown, but no Flood Hazard Factors are determined.
Zones A1-A7, A9-A13, A20:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to Flood Hazard Factors.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

The flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are summarized in Table 3.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for Lafayette is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Insurance Administration.

6.0 OTHER STUDIES

Flood Insurance Studies are in progress for the unincorporated areas of Contra Costa County, California (Reference 10), the City of Walnut Creek, California (Reference 11), and the Town of Moraga, California (Reference 12). The results of these studies will match exactly with the Lafayette Flood Insurance Study.

The results of this study represent a more detailed and accurate analysis of flood elevations than those shown on the Flood Hazard Boundary Map for Lafayette (Reference 13).

No other flood studies are known to be published for the City of Lafayette.

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supersede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, 450 Golden Gate Avenue, P.O. Box 36003, San Francisco, California 94102.

8.0 BIBLIOGRAPHY AND REFERENCES

1. Harold E. Davis, Short History of Contra Costa County, 1965

2. Contra Costa County Planning Department, Contra Costa County - A Profile, September 1976

3. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, Climatological Data, published annually

4. U.S. Department of Agriculture, Soil Conservation Service, Contra Costa County General Soil Survey and Report, T.W. Holmes and I. E. Welch, August 1966

5. U.S. Water Resources Council, "Guidelines for Determining Flood Flow Frequency," Bulletin 17, March 1976

6. U.S. Department of the Interior, Geological Survey, National Water Data Storage and Retrieval System, (WATSTORE), November 1976

7. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, November 1976

8. Tudor Engineering Company, HP-9845 Culvert Analysis Program, October 1977

9. Towill Inc., Topographic Maps, Scale 1:3600, Contour Interval 2 feet: Contra Costa County, California, April 1977

10. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Contra Costa County, California (Unincorporated Areas), unpublished

11. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Walnut Creek, California, unpublished

12. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Town of Moraga, California, unpublished

13. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Lafayette, California, Scale 1:9600, December 5, 1975

Chow, Ven Te, Open-Channel Hydraulics, New York: McGraw-Hill, Inc., 1959

Contra Costa County Flood Control and Water Conservation District, Hydrology Standards-Contra Costa County, 1975

Contra Costa County Flood Control and Water Conservation District, Mean Seasonal Isohyets, Compiled from Precipitation Records 1879-1973, 1975

King, W. K., and E. F. Brater, Handbook of Hydraulics, 5th Edition, New York: McGraw-Hill Inc., 1963

Portland Cement Association, Handbook of Concrete Culvert Pipe Hydraulics, 1964

U.S. Department of Agriculture, Soil Conservation Service, Contra Costa County, General Soil Survey and Report, January 1968

U.S. Department of Housing and Urban Development and U.S. Department of the Interior, Basic Data Contribution 32, San Francisco Bay Region Environment and Resources Planning Study, Mean Annual Precipitation Depth-Duration-Frequency Data for the San Francisco Bay Region, California, 1971

U.S. Department of the Interior, Geological Survey, Adjustment of Logarithmic Flood Frequency Statistics for Gaged California Streams To Minimize Time Sampling Error, Research Journal Vol. 3, No. 1, S. E. Rantz and J. R. Crippen, 1975

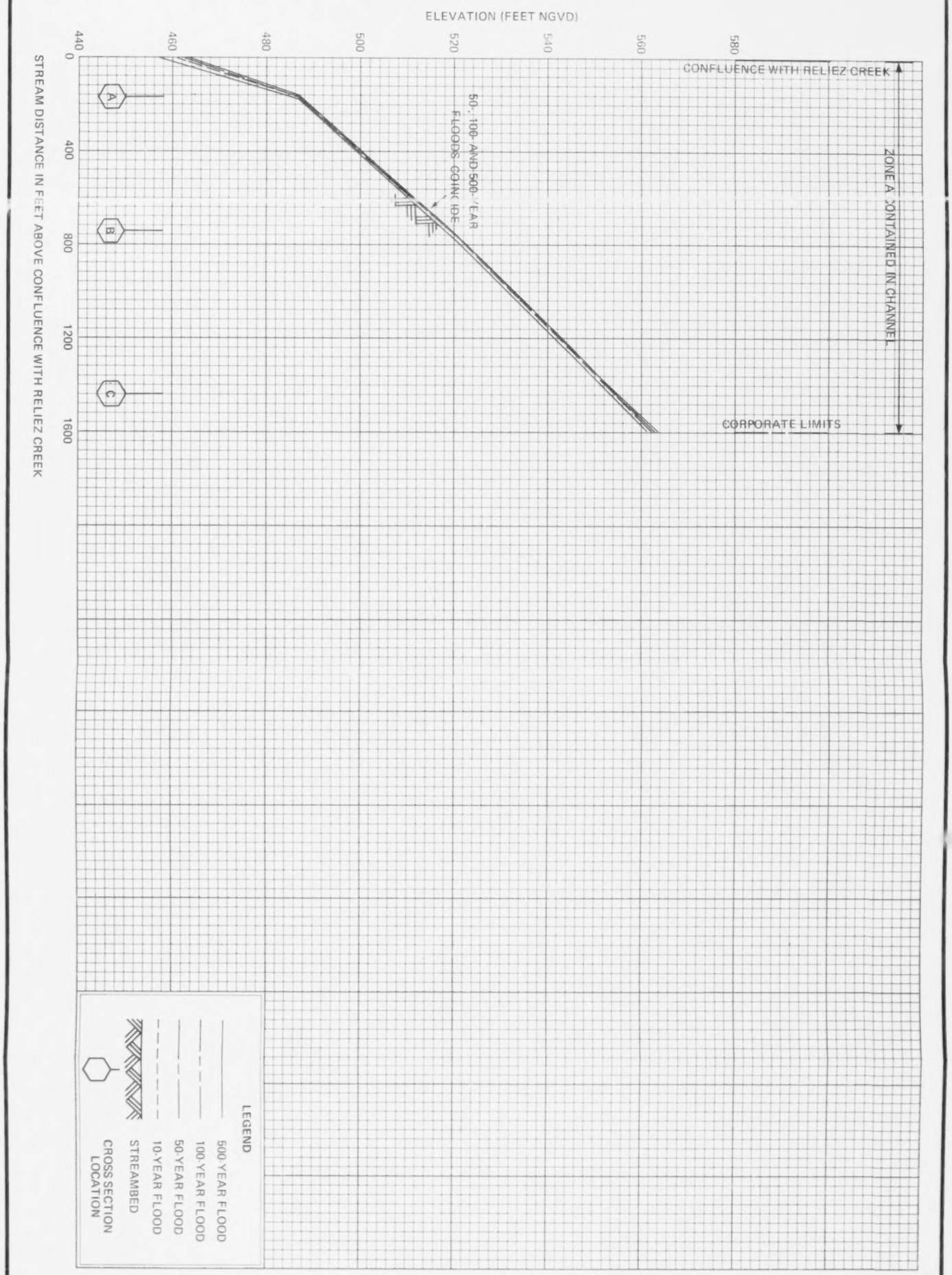
U.S. Department of the Interior, Geological Survey, "Some Statistical Tools in Hydrology," Techniques of Water-Resources Investigations of the U.S. Geological Survey, H. C. Riggs, 1968

U.S. Department of the Interior, Geological Survey, Suggested Criteria for Hydrologic Design of Storm-Drainage Facilities in San Francisco Bay Region, California, Menlo Park, California, 1971

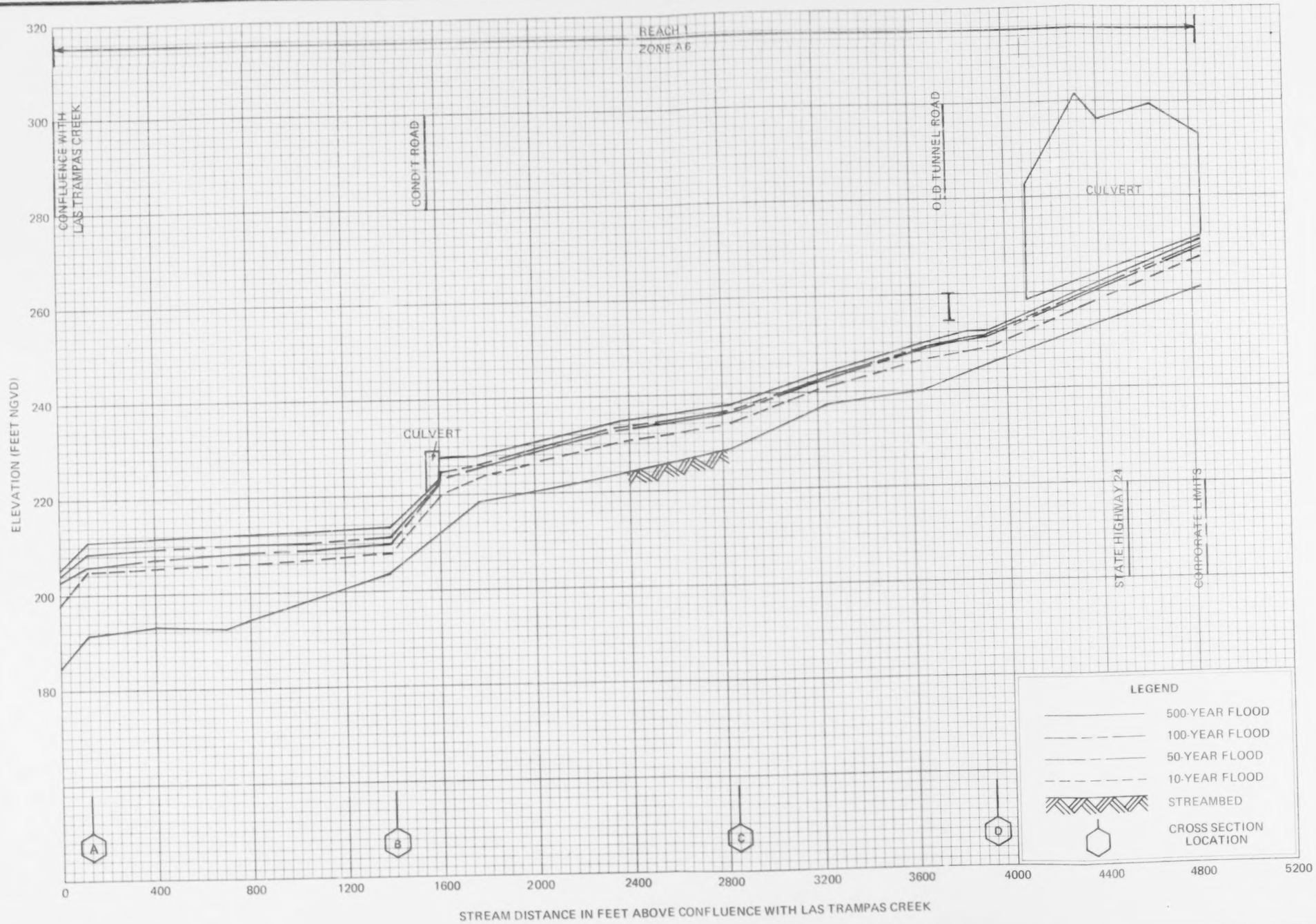
U.S. Department of the Interior, Geological Survey, Water-Resources Investigation 77-83, A Technique for Determining Depths for T-Year Discharge in Rigid Boundary Channels, December 1977

U.S. Department of the Interior, Geological Survey, Water-Supply Paper 1685, Magnitude and Frequency of Floods in the United States, Part II, Vol. 1967

U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 feet: Walnut Creek, California (1972); Briones Valley, California, (1972), Las Trampas Ridge, California (1972)



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration **CITY OF LAFAYETTE, CA** [CONTRA COSTA CO.]	**FLOOD PROFILES** **NORTH BRANCH RELIEZ CREEK**



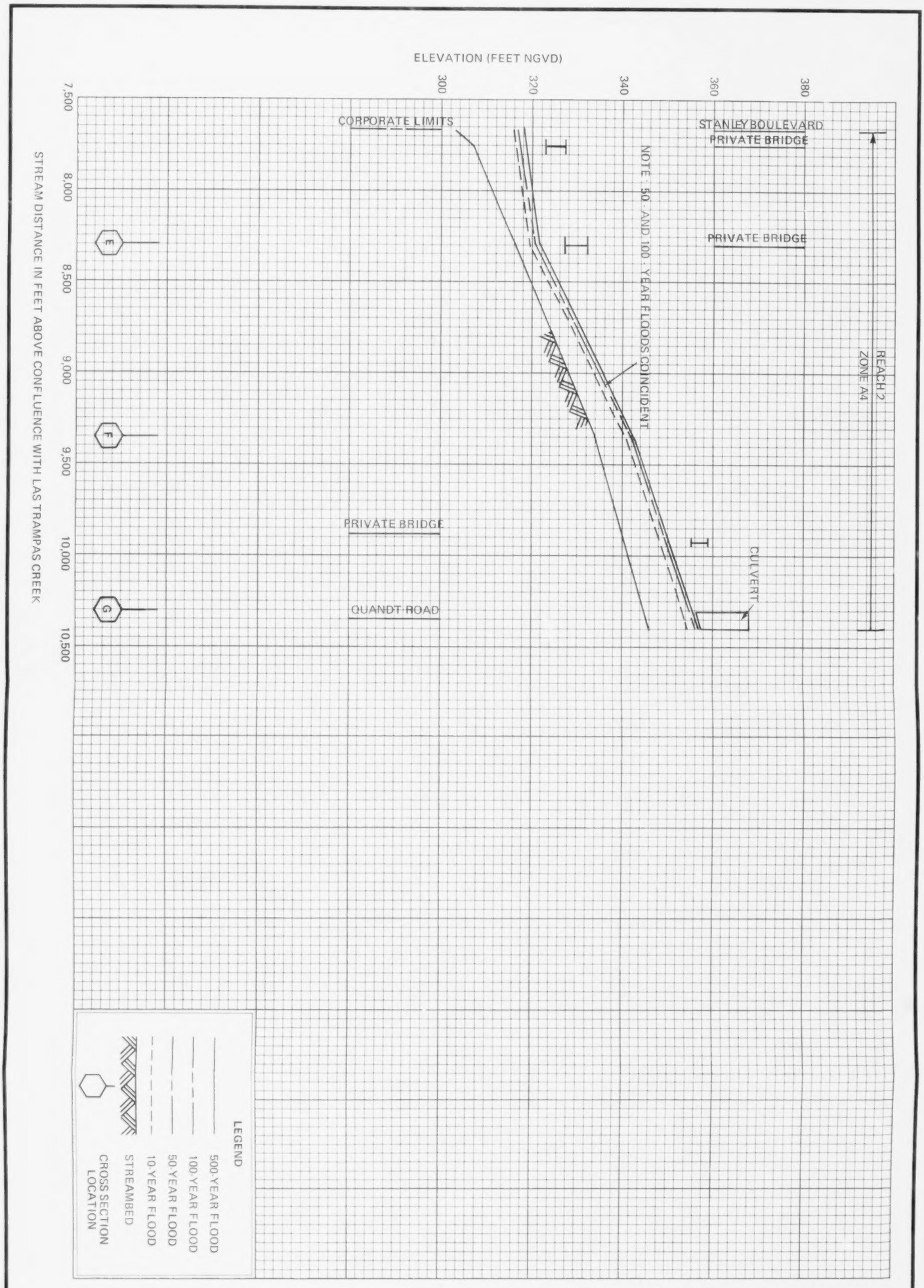
FLOOD PROFILES

RELIEZ CREEK

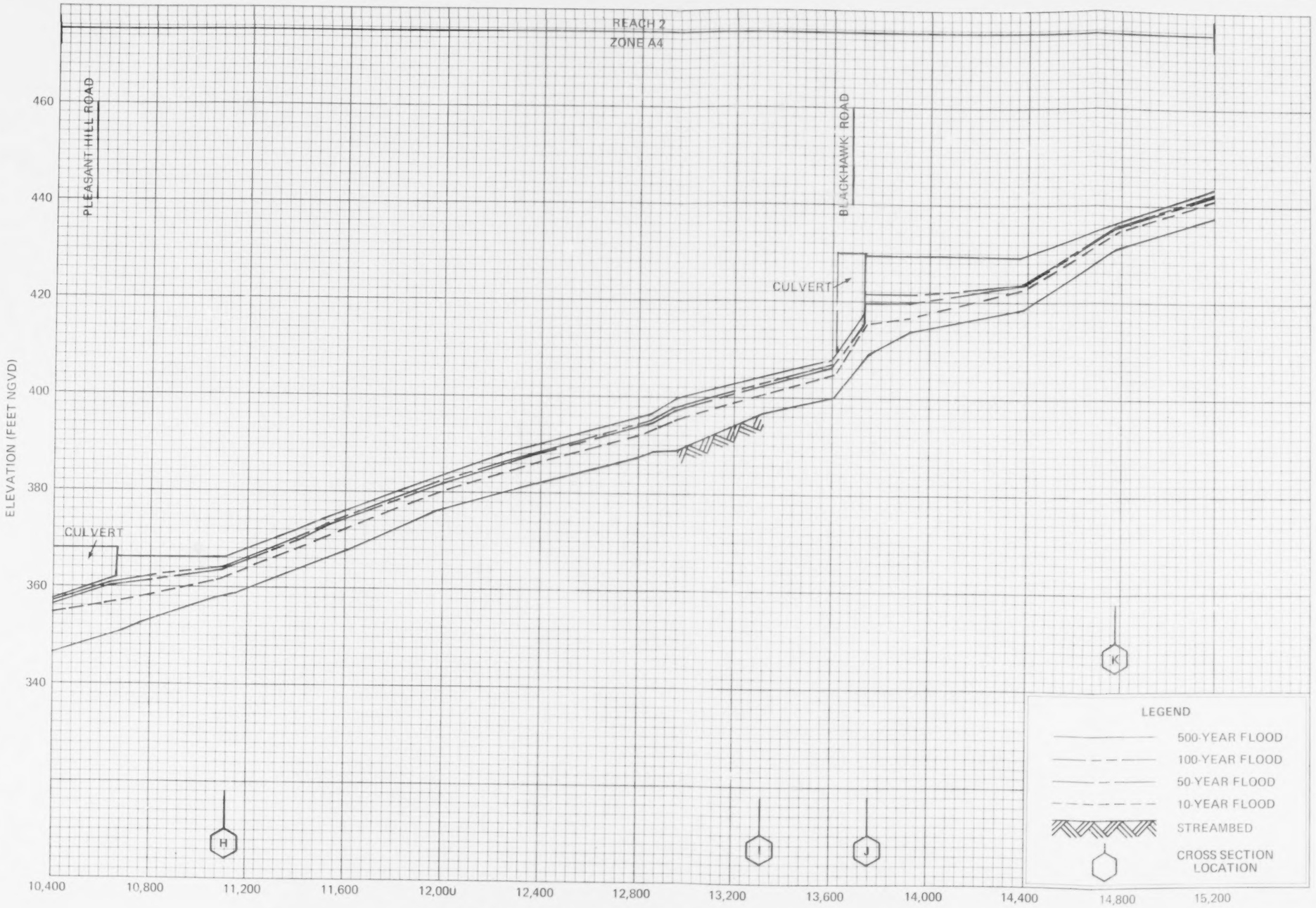
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

02P



03P	FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration **CITY OF LAFAYETTE, CA** (CONTRA COSTA CO.)	**FLOOD PROFILES** **RELIEZ CREEK**



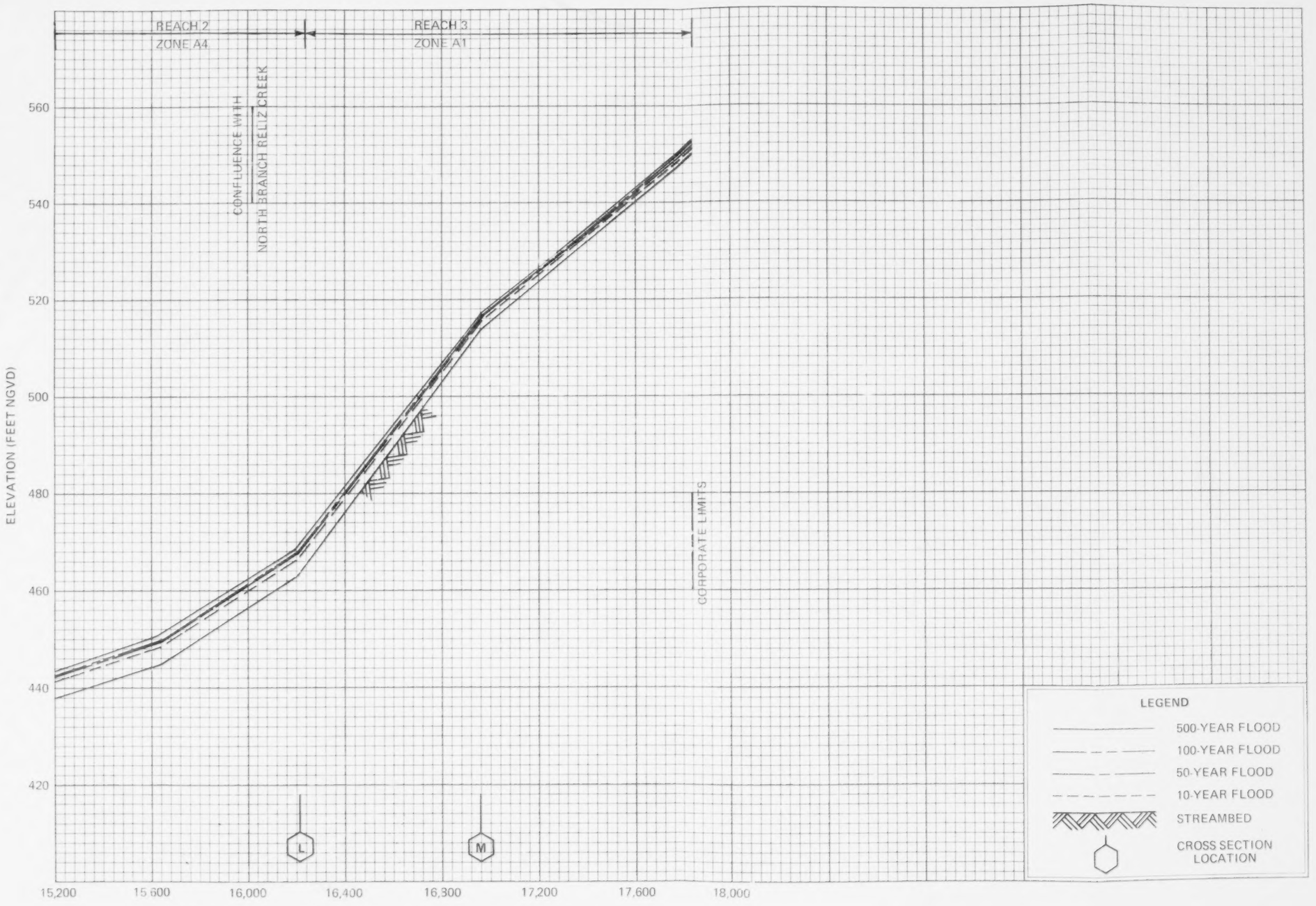
FLOOD PROFILES

RELIEZ CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

04P



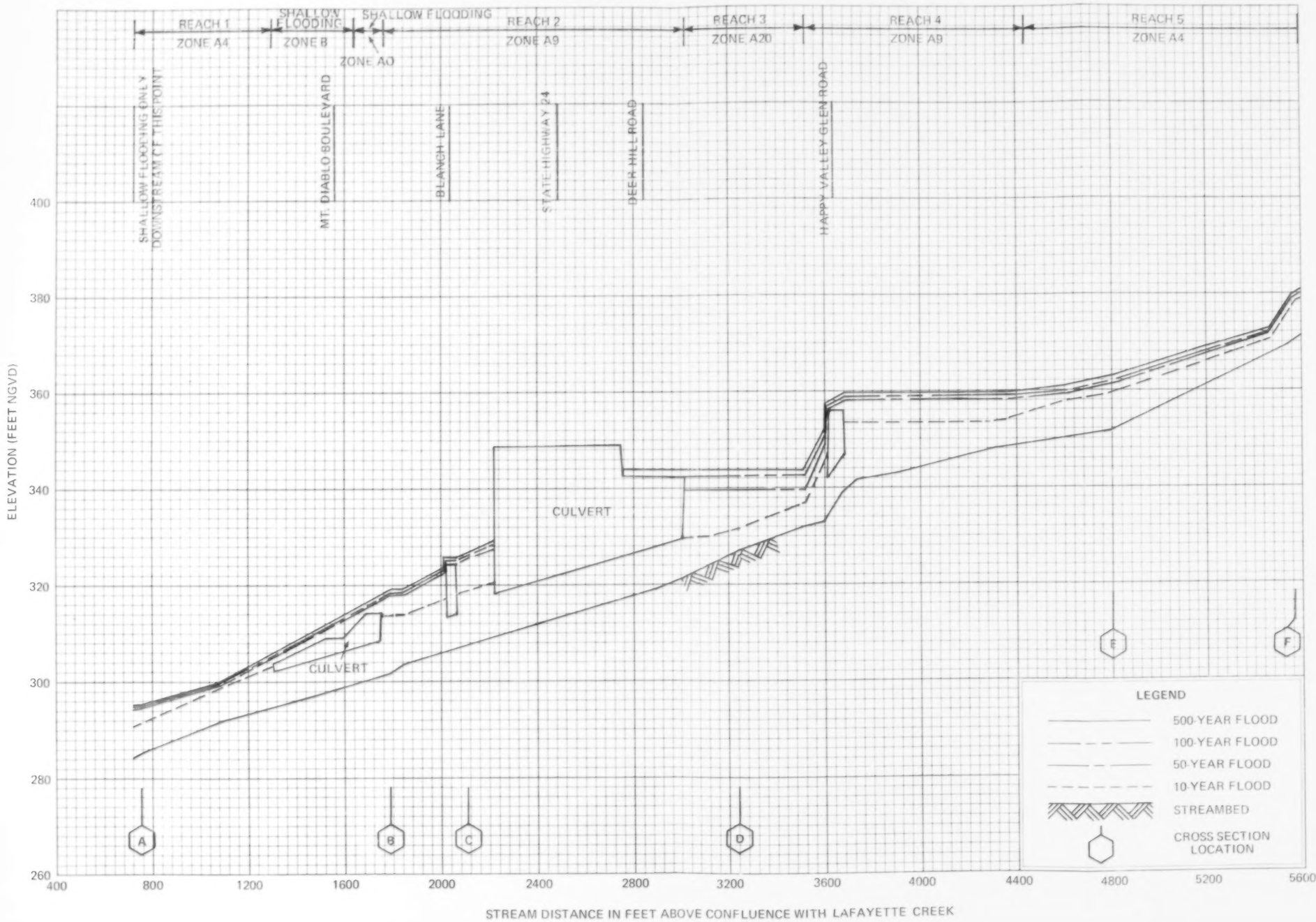
FLOOD PROFILES

RELIEZ CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

05P



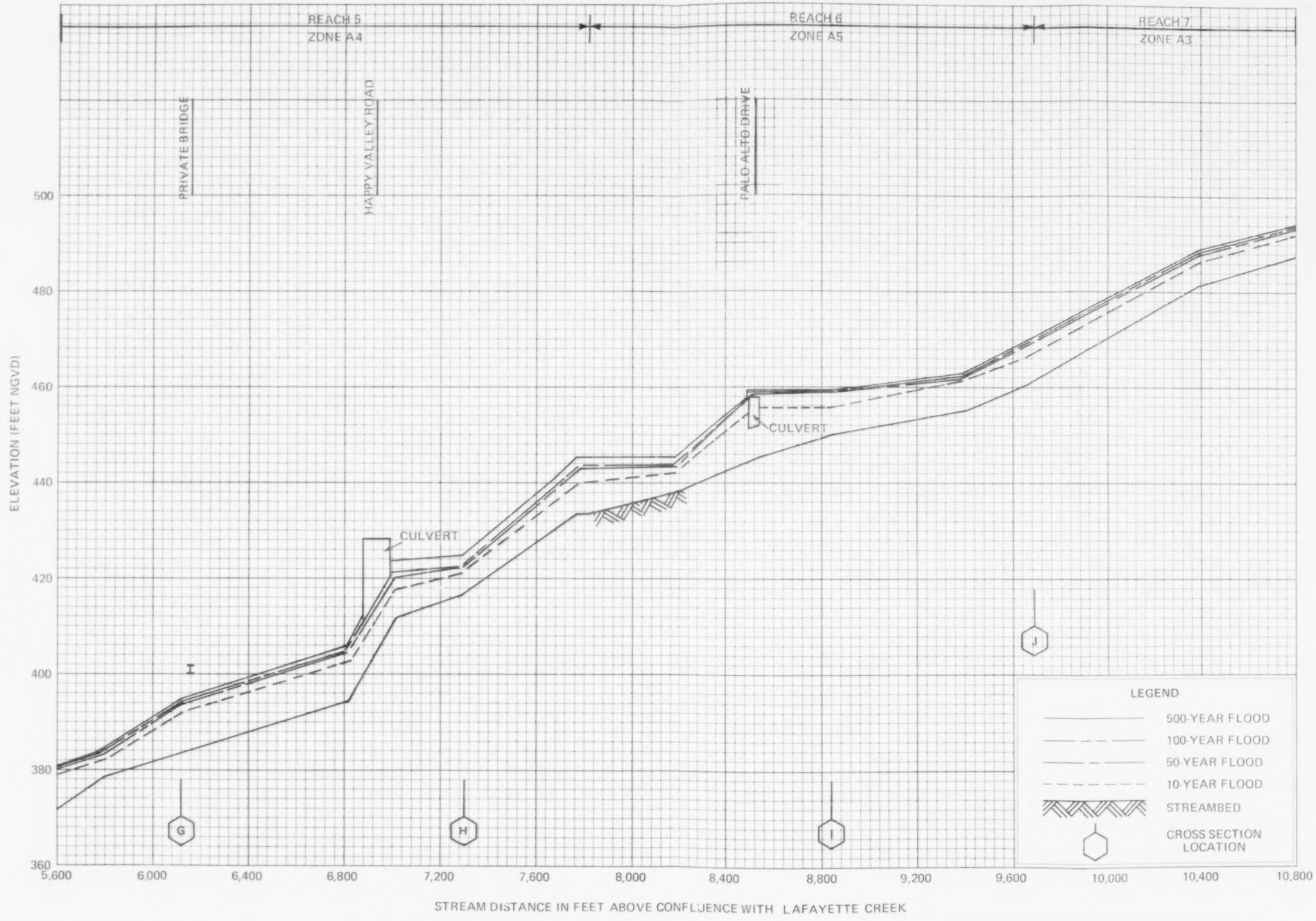
FLOOD PROFILES

HAPPY VALLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

06P



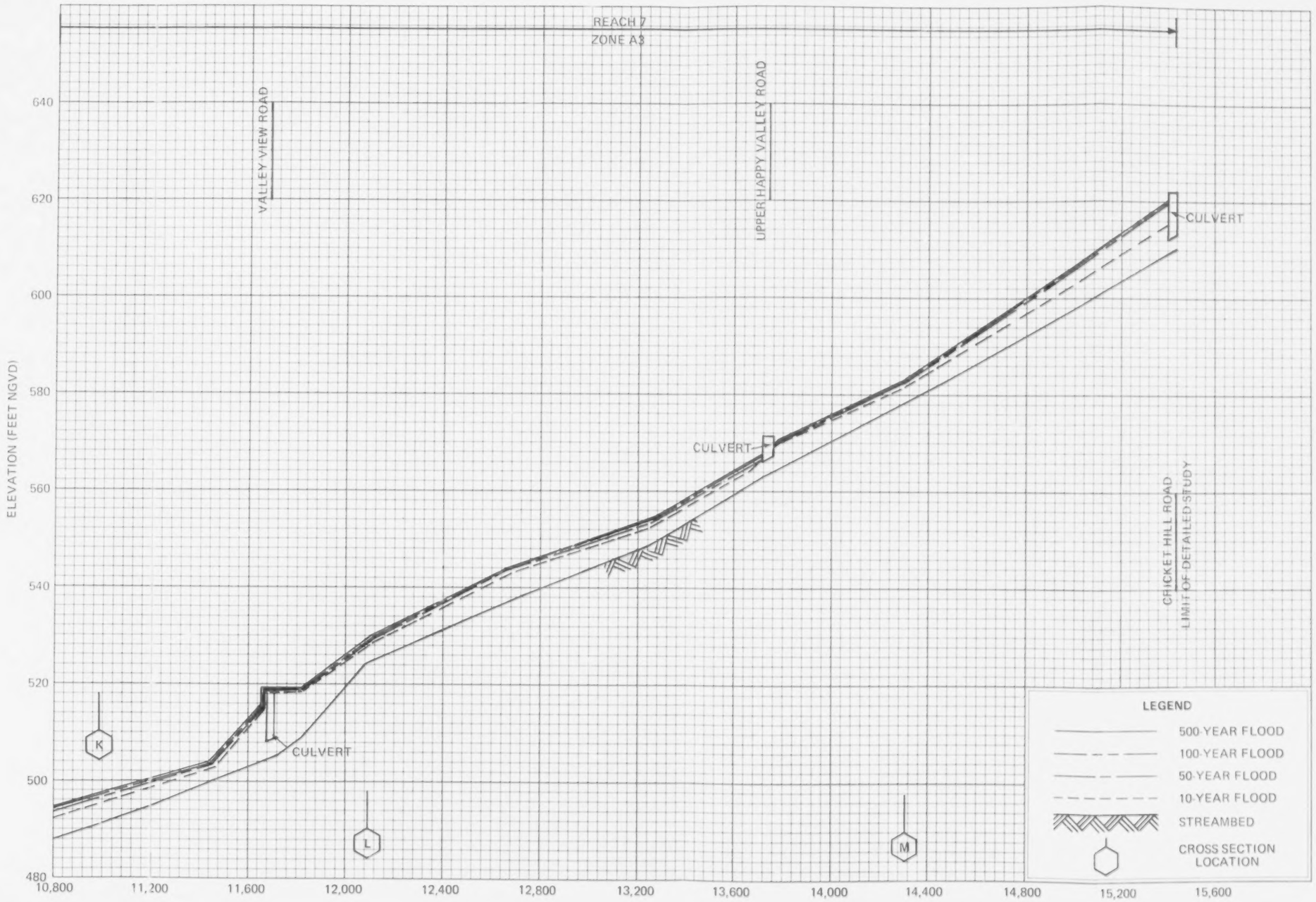
FLOOD PROFILES

HAPPY VALLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

07P



FLOOD PROFILES

HAPPY VALLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

08P

REACH 1 ZONE A3 | SHALLOW FLOODING ZONE AH | SHALLOW FLOODING ZONE AO | REACH 2 ZONE A2 | REACH 3 ZONE A12 | REACH 4 ZONE A3

SHALLOW FLOODING ONLY DOWNSTREAM OF THIS POINT

ACALANES ROAD

HIGHWAY RAMP INLET

HIDDEN VALLEY ROAD

CULVERT

CULVERT

LIMIT OF DETAILED STUDY

ELEVATION (FEET NGVD)

540
520
500
480
460
440
420
400
380

1600 2000 2400 2800 3200 3600 4000 4400 4800 5200 5600 6000 6400 6800

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LAFAYETTE CREEK

A B C D

LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 50-YEAR FLOOD
- 10-YEAR FLOOD
- STREAMBED
- CROSS SECTION LOCATION

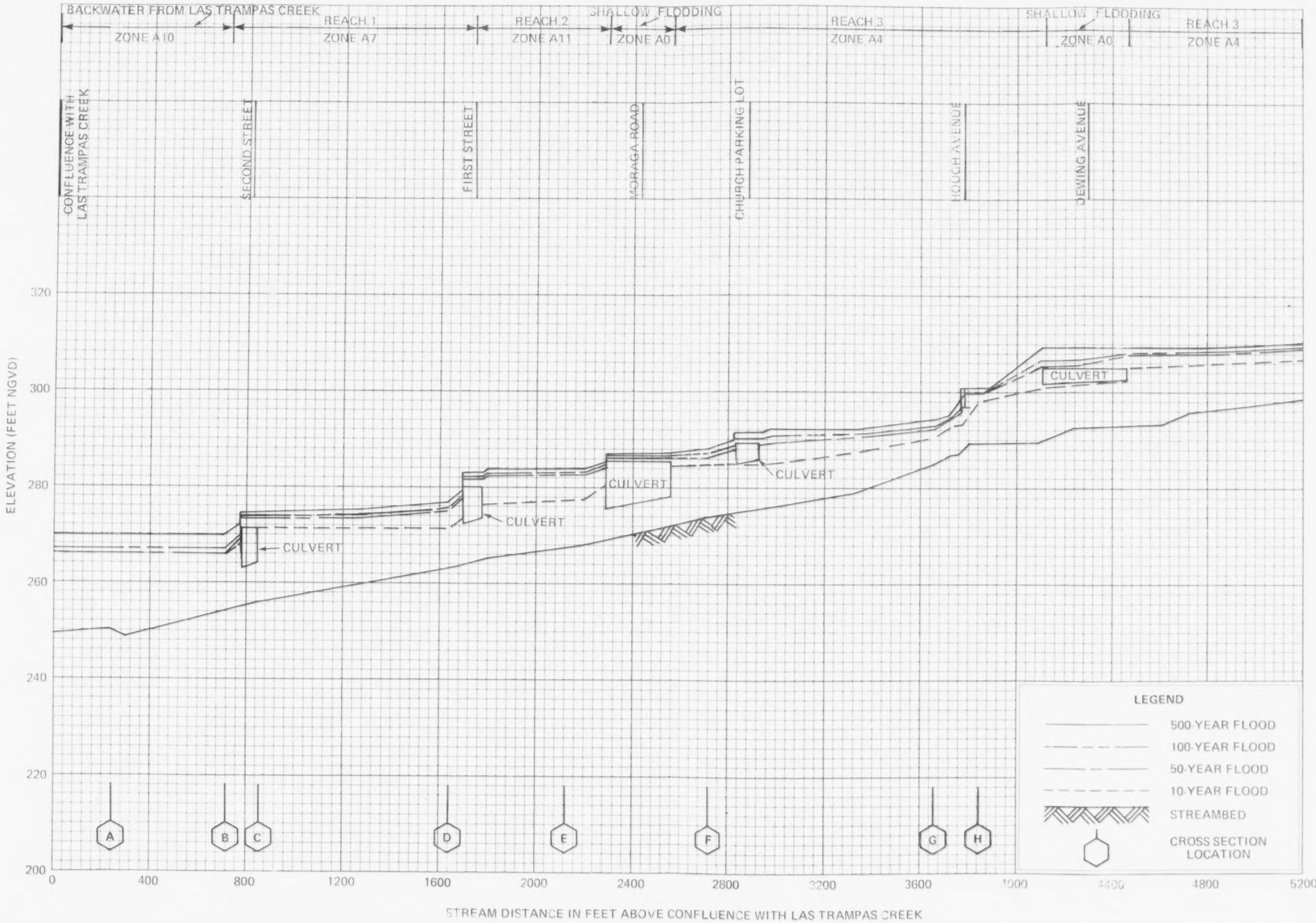
FLOOD PROFILES

HIDDEN VALLEY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

09P



FLOOD PROFILES

LAFAYETTE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

10P

REACH 3
ZONE A4

MOUNTAIN VIEW DRIVE
VILLAGE CENTER DRIVE
MT. DIABLO BOULEVARD
EAST BAY MUNICIPAL UTILITY DISTRICT FILTER PLANT BRIDGE

CULVERT
CULVERT
CULVERT

ELEVATION (FEET NGVD)

380
360
340
320
300
280

I J K L M N O P Q R

5,200 5,600 6,000 6,400 6,800 7,200 7,600 8,000 8,400 8,800 9,200 9,600 10,000 10,400

STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH LAS TRAMPAS CREEK

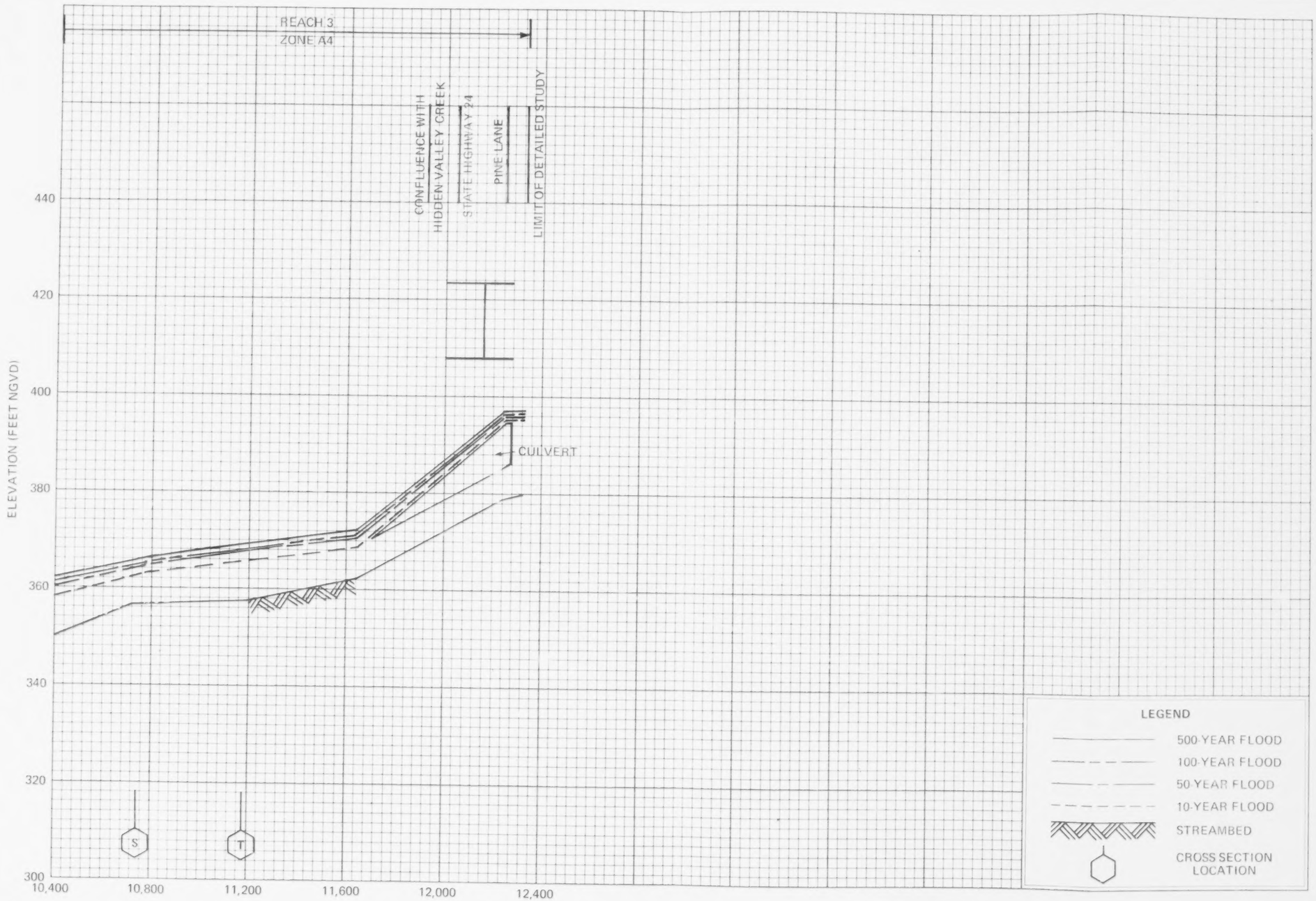
LEGEND
500-YEAR FLOOD
100-YEAR FLOOD
50-YEAR FLOOD
10-YEAR FLOOD
STREAMBED
CROSS SECTION LOCATION

FLOOD PROFILES

LAFAYETTE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)



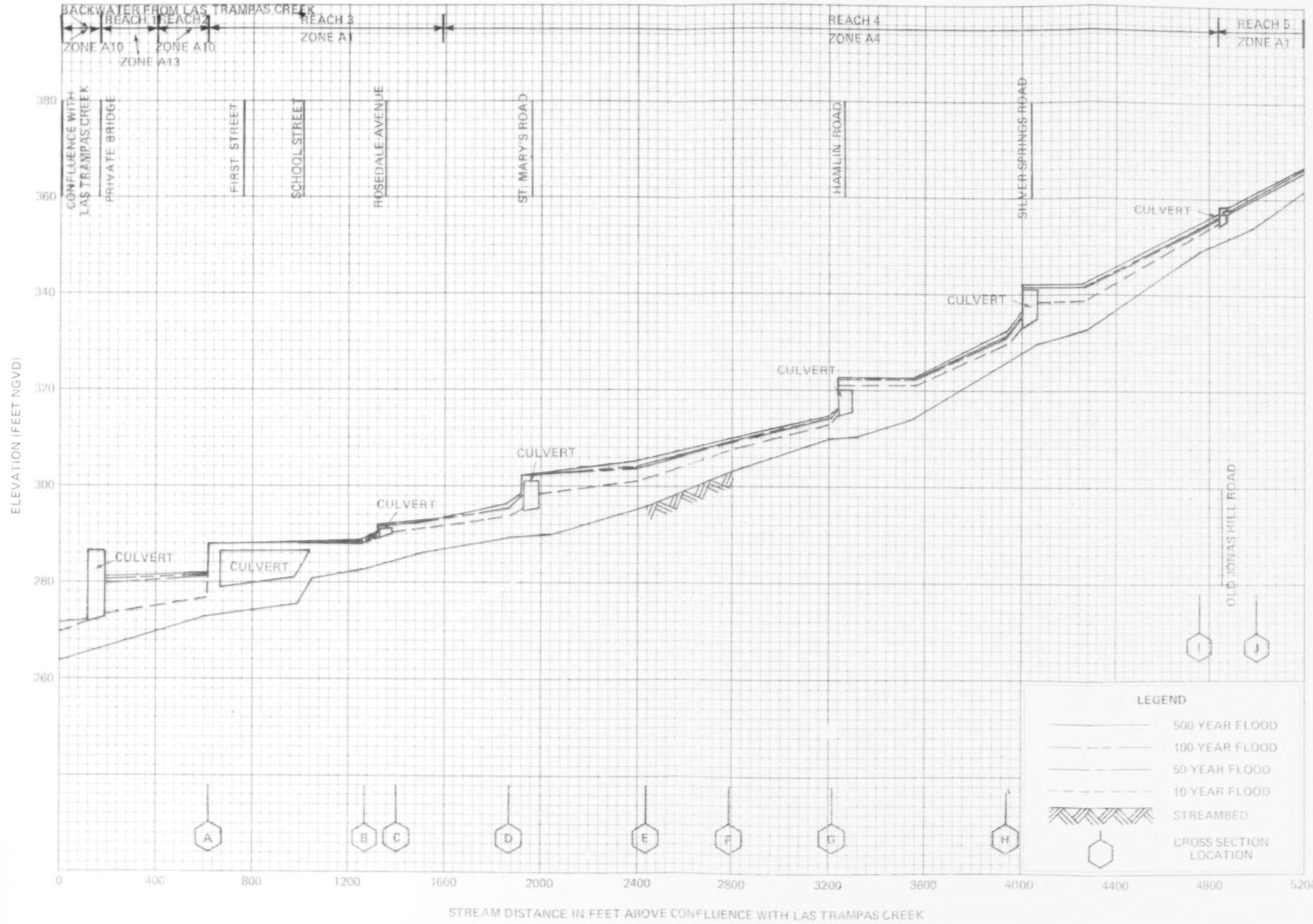
FLOOD PROFILES

LAFAYETTE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

12P



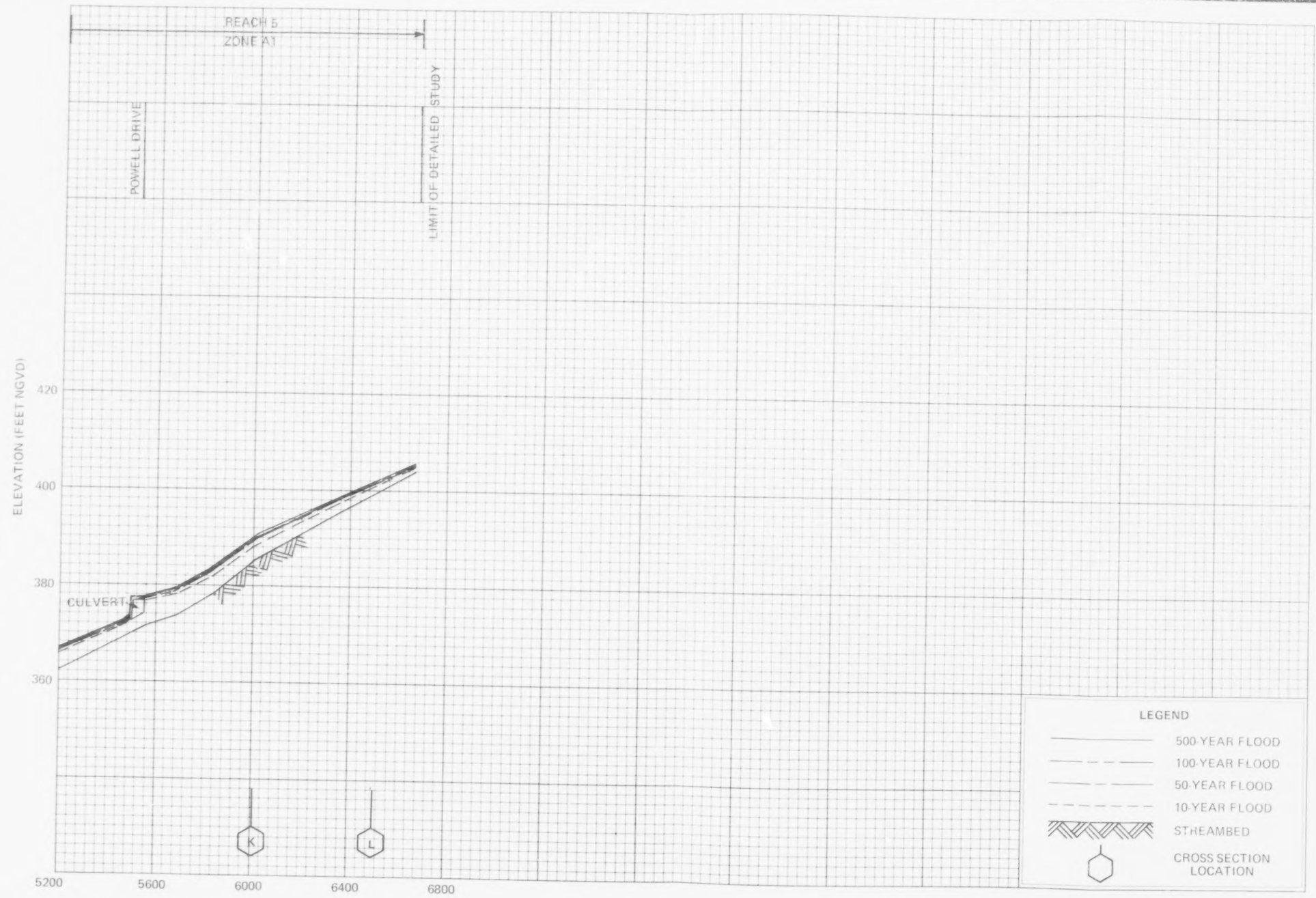
FLOOD PROFILES

JONAS HILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

13P



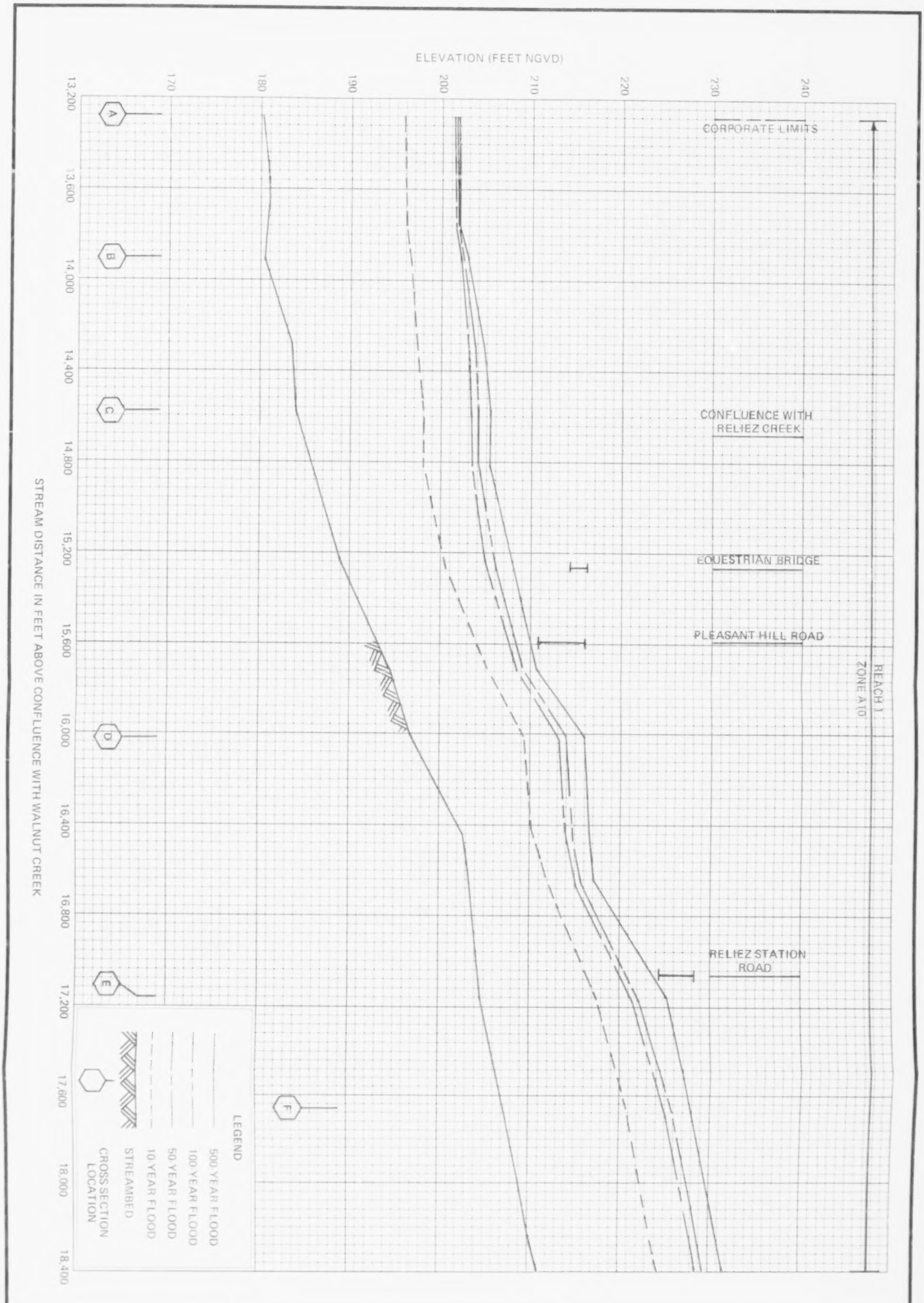
FLOOD PROFILES

JONAS HILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

14P



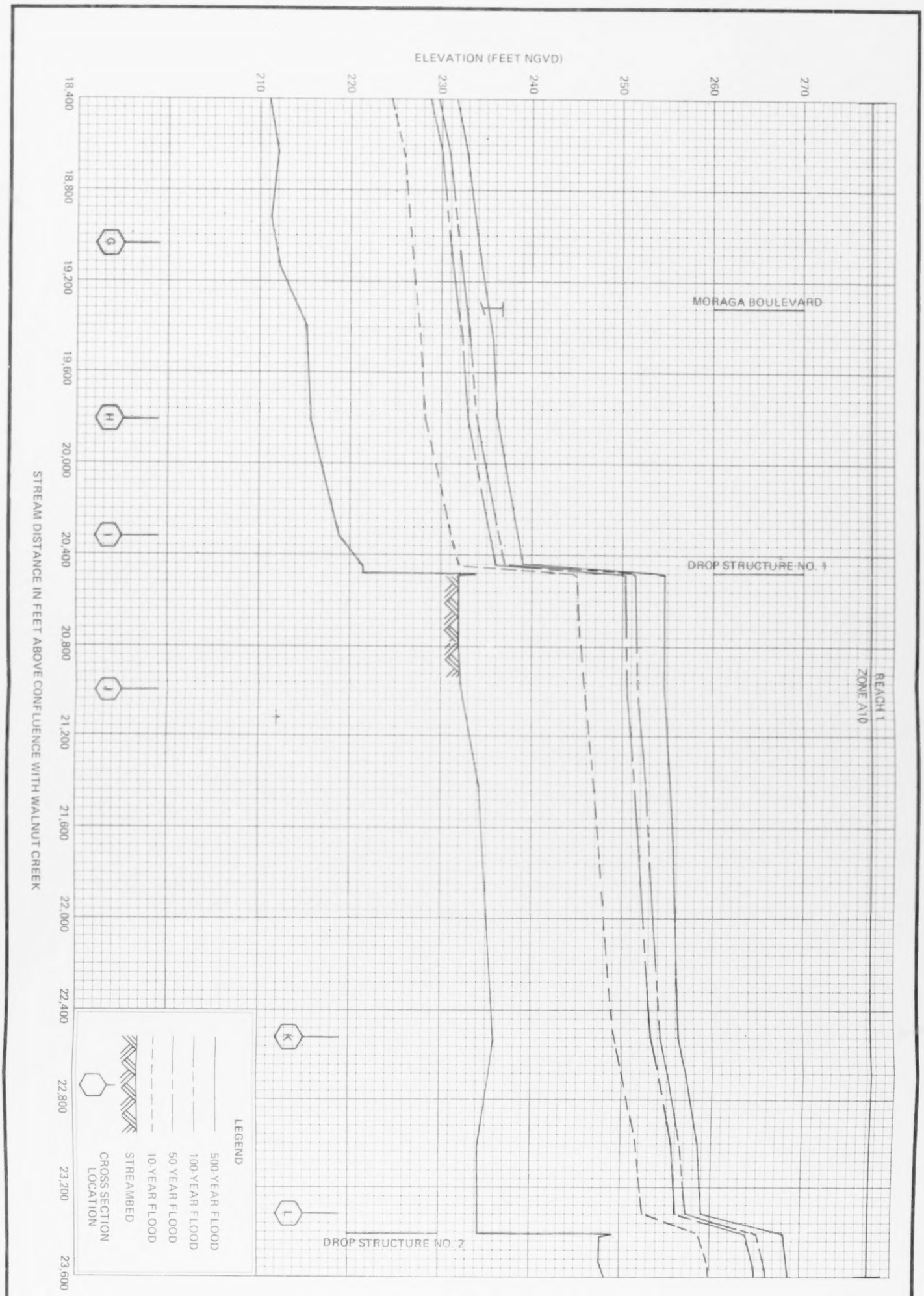
15P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
[CONTRA COSTA CO.]

FLOOD PROFILES

LAS TRAMPAS CREEK



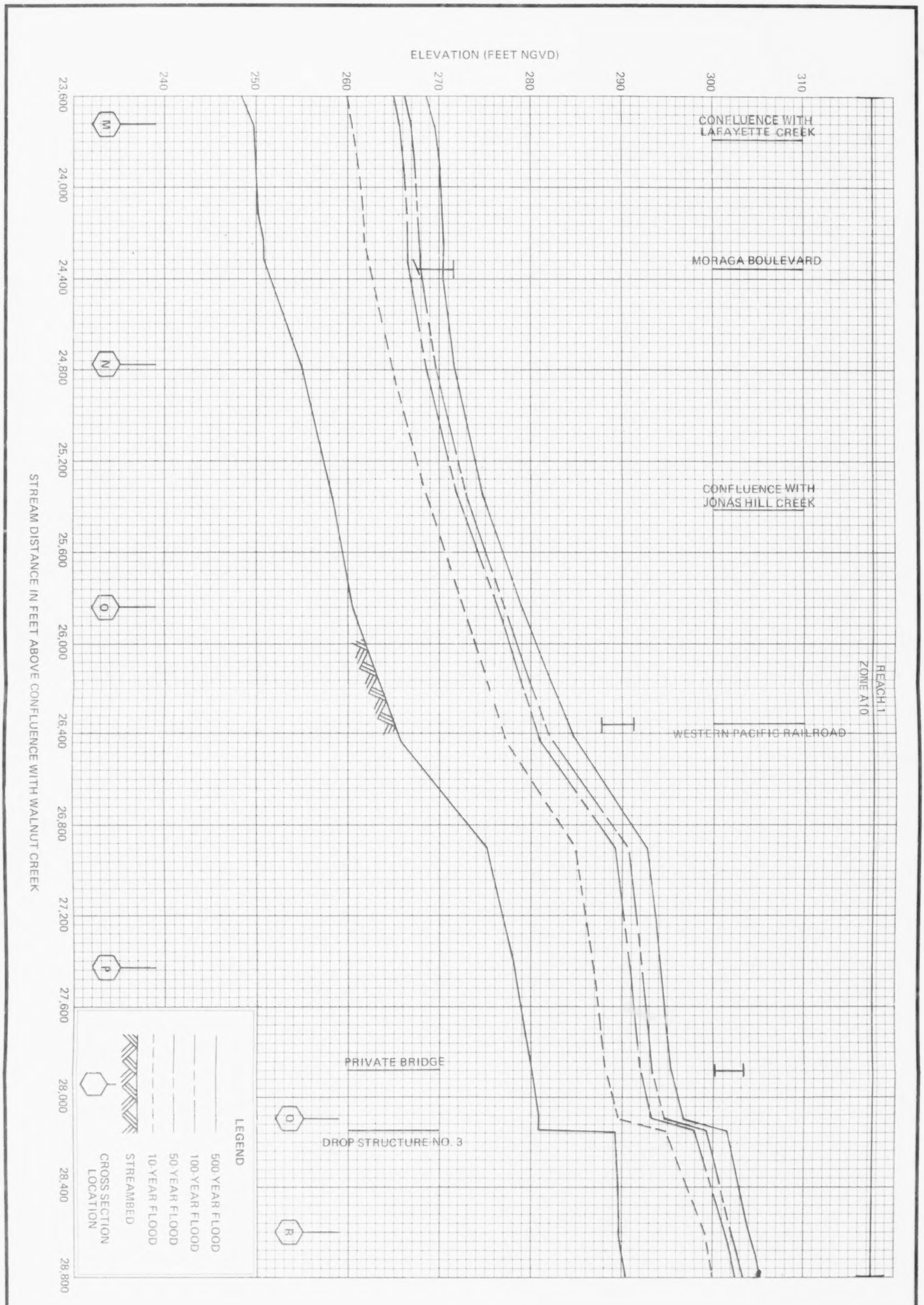
16P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOOD PROFILES

LAS TRAMPAS CREEK



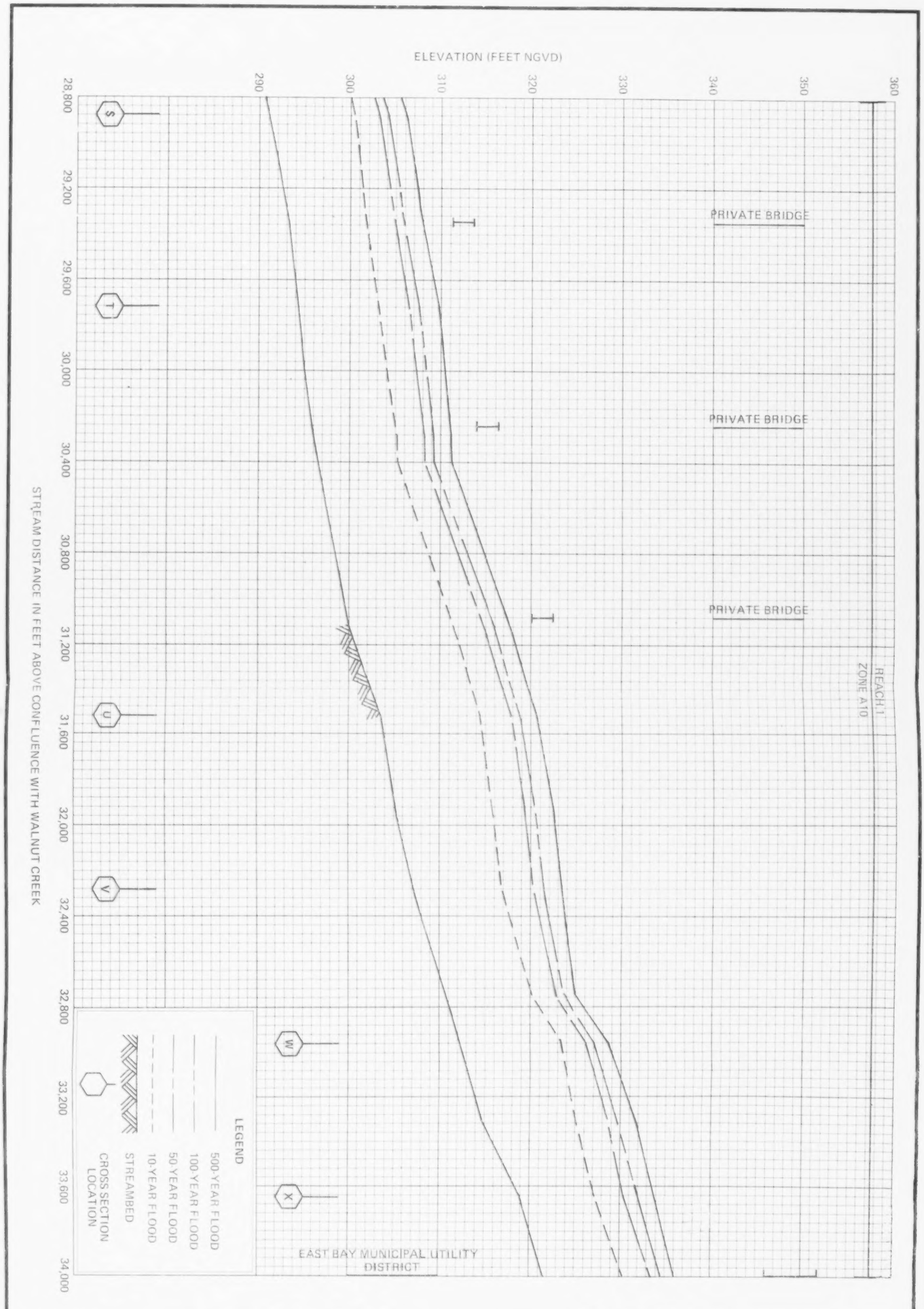
17P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOOD PROFILES

LAS TRAMPAS CREEK



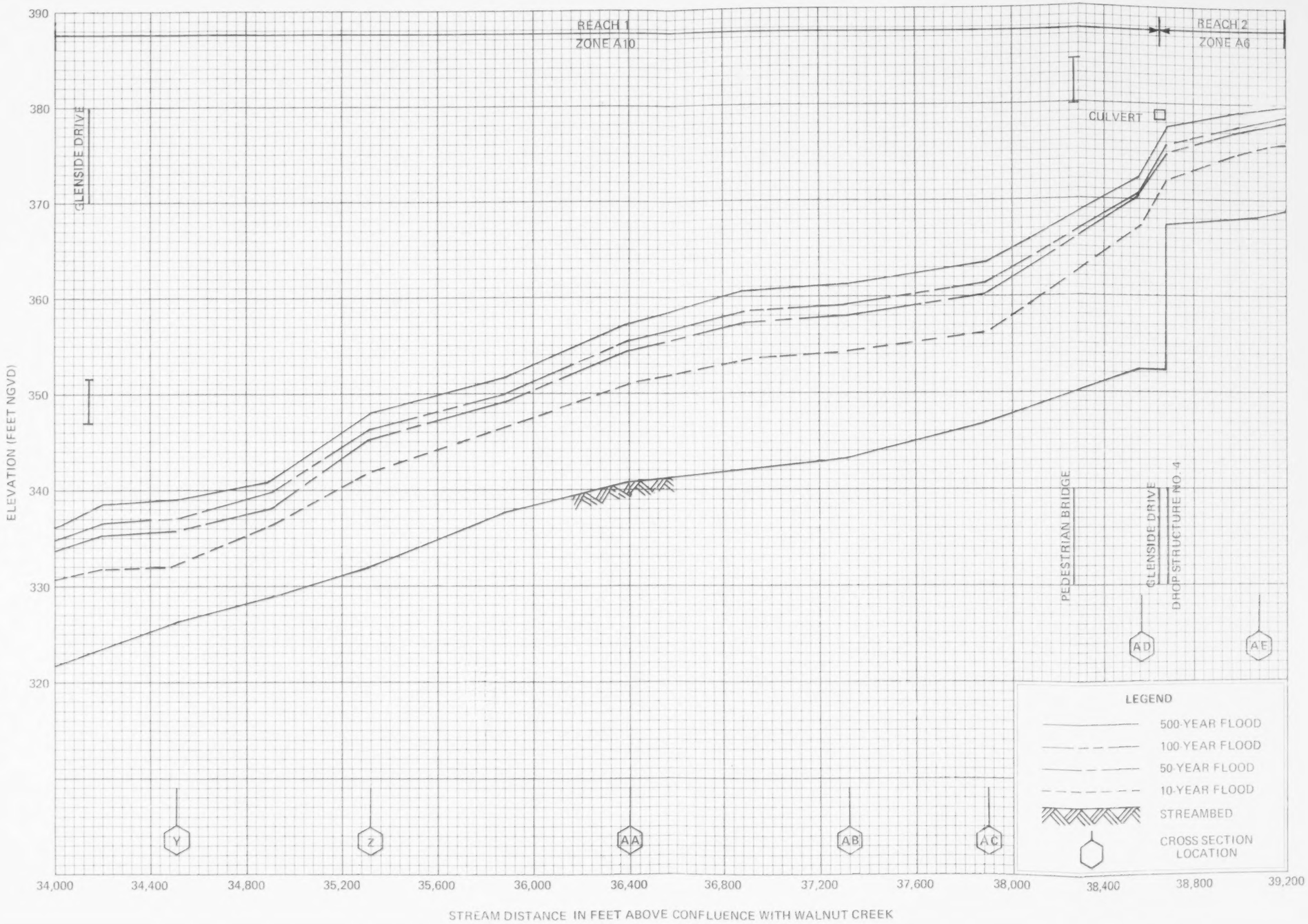
18P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOOD PROFILES

LAS TRAMPAS CREEK



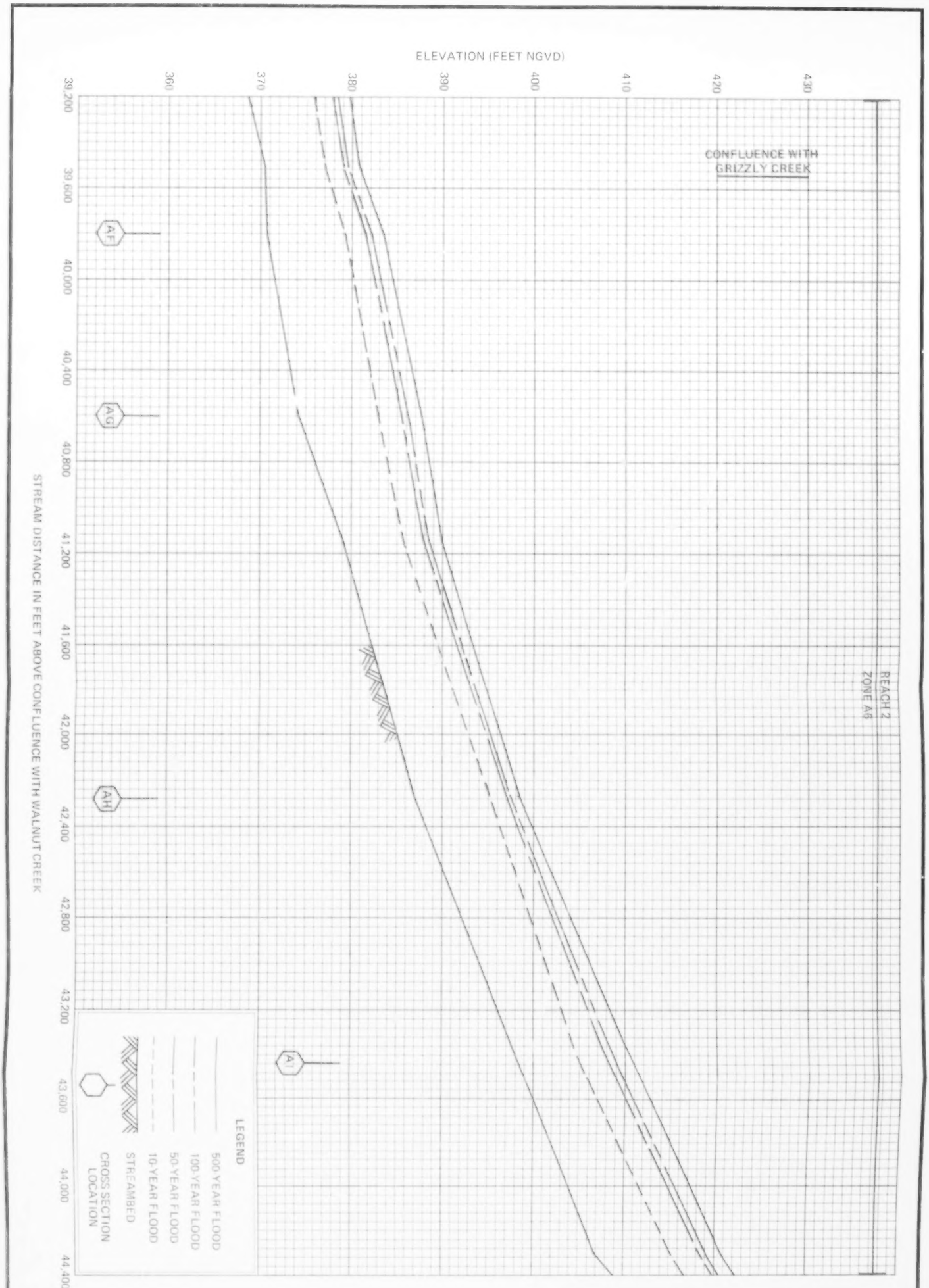
FLOOD PROFILES

LAS TRAMPAS CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

19P



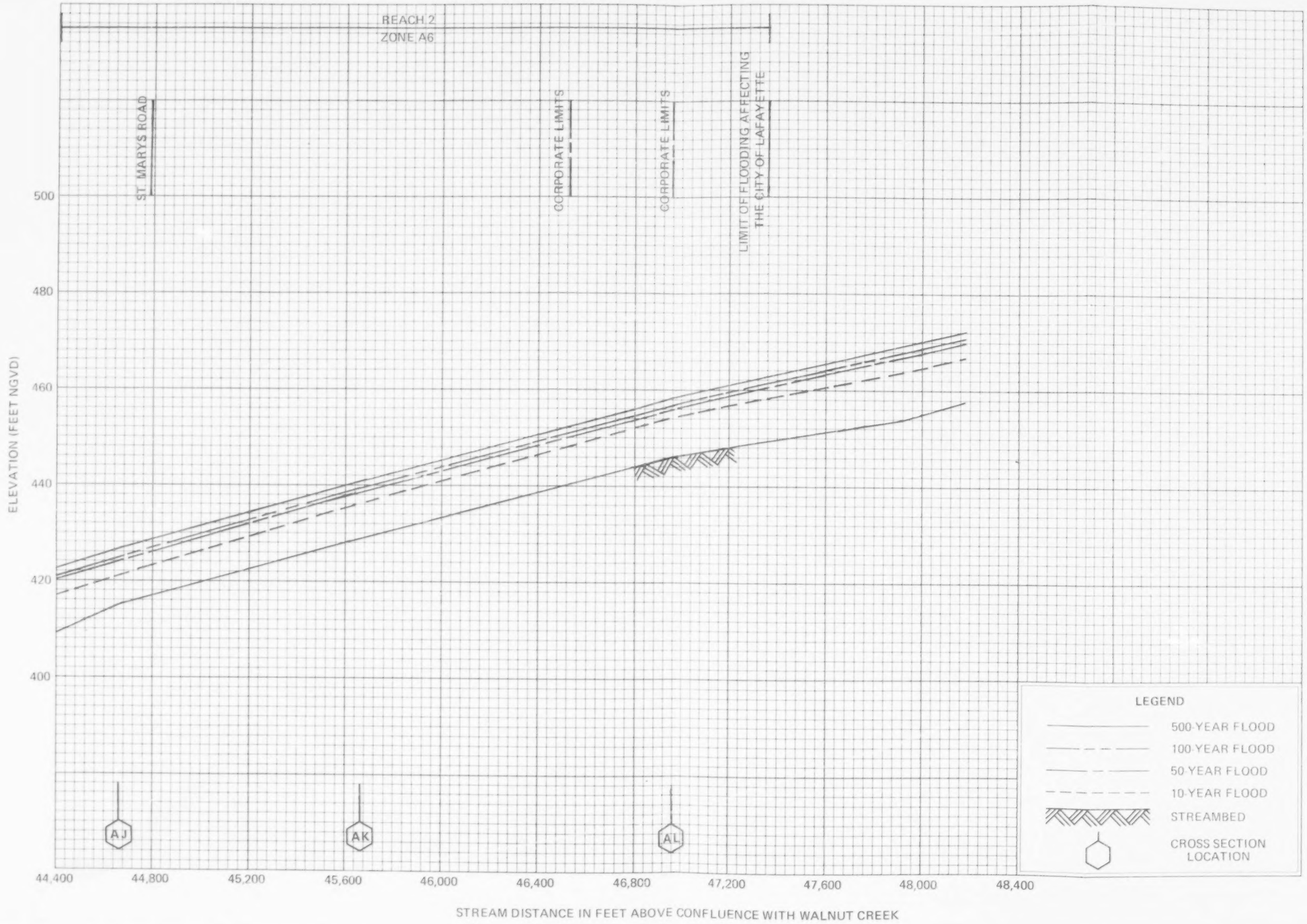
20P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOOD PROFILES

LAS TRAMPAS CREEK



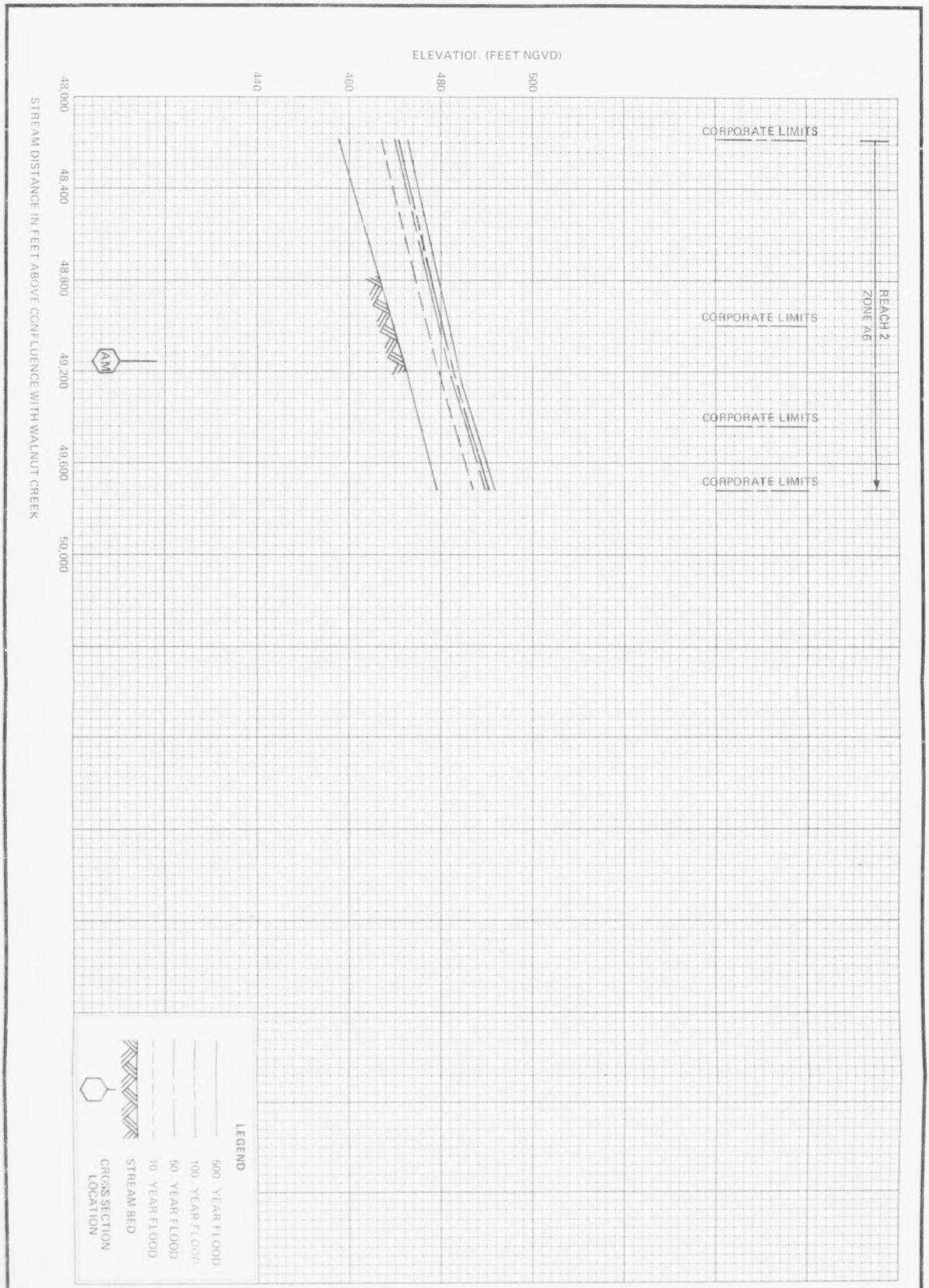
FLOOD PROFILES

LAS TRAMPAS CREEK

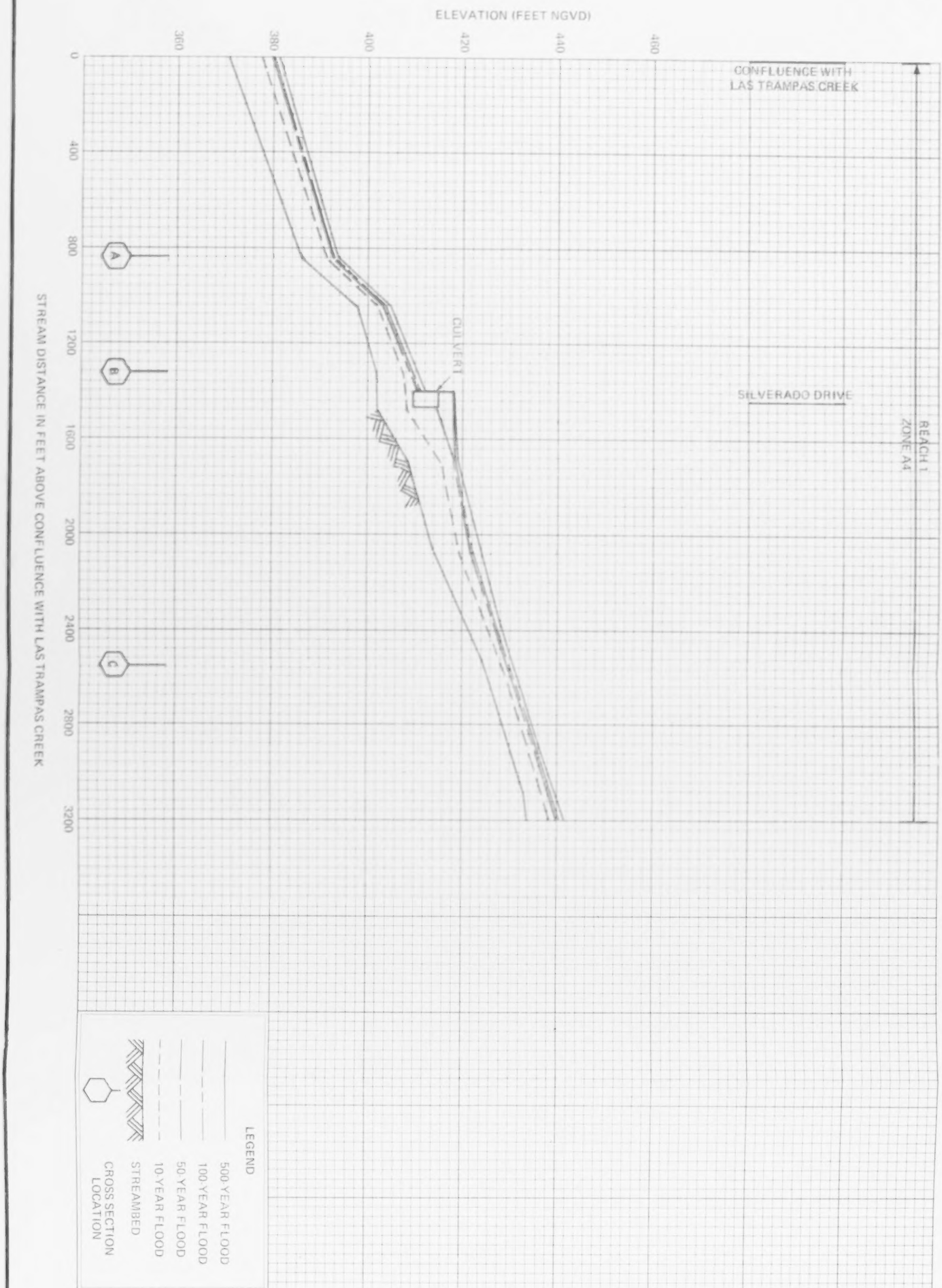
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

21P



22P	FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration **CITY OF LAFAYETTE, CA** (CONTRA COSTA CO.)	**FLOOD PROFILES** **LAS TRAMPAS CREEK**



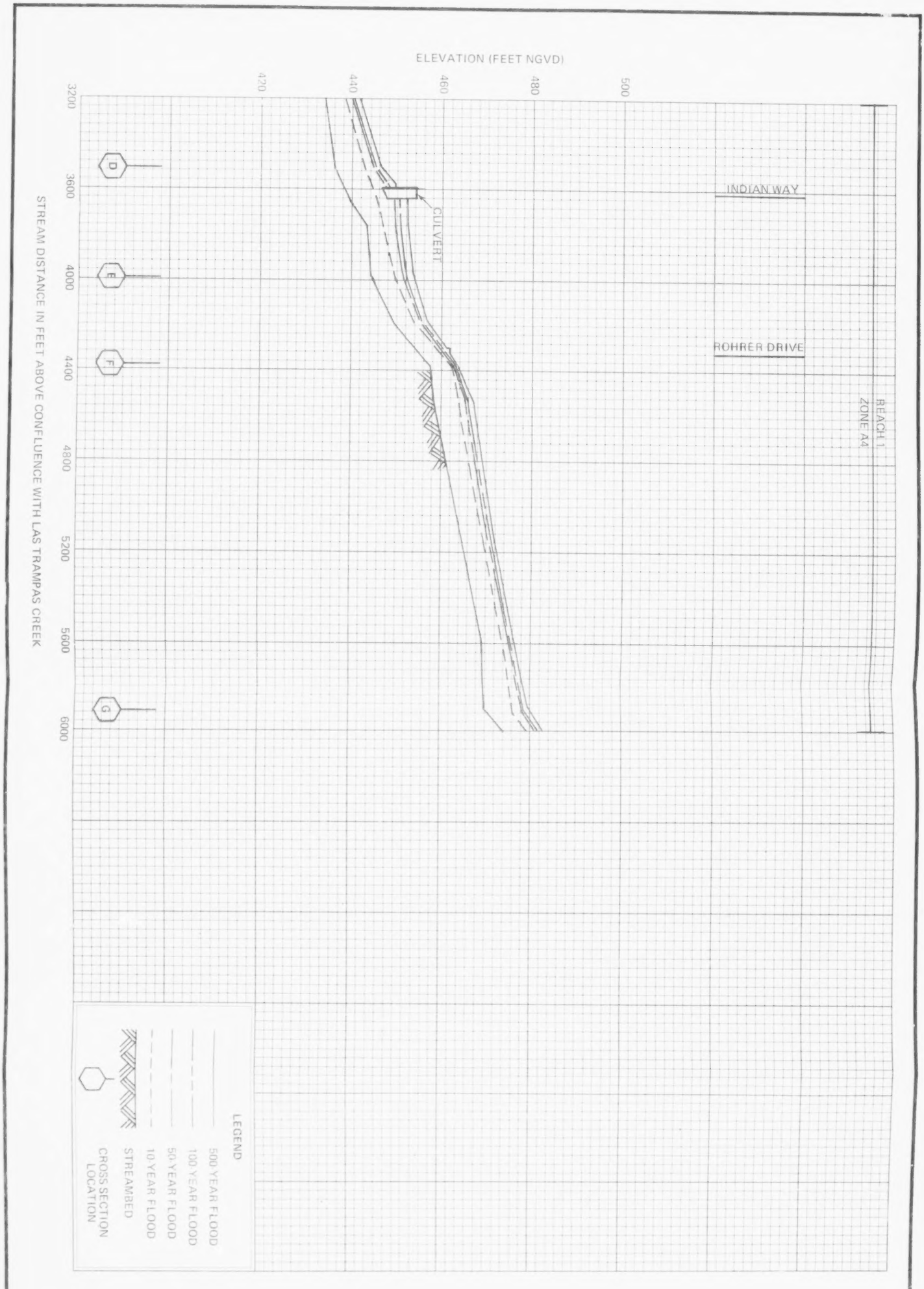
23P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOOD PROFILES

GRIZZLY CREEK



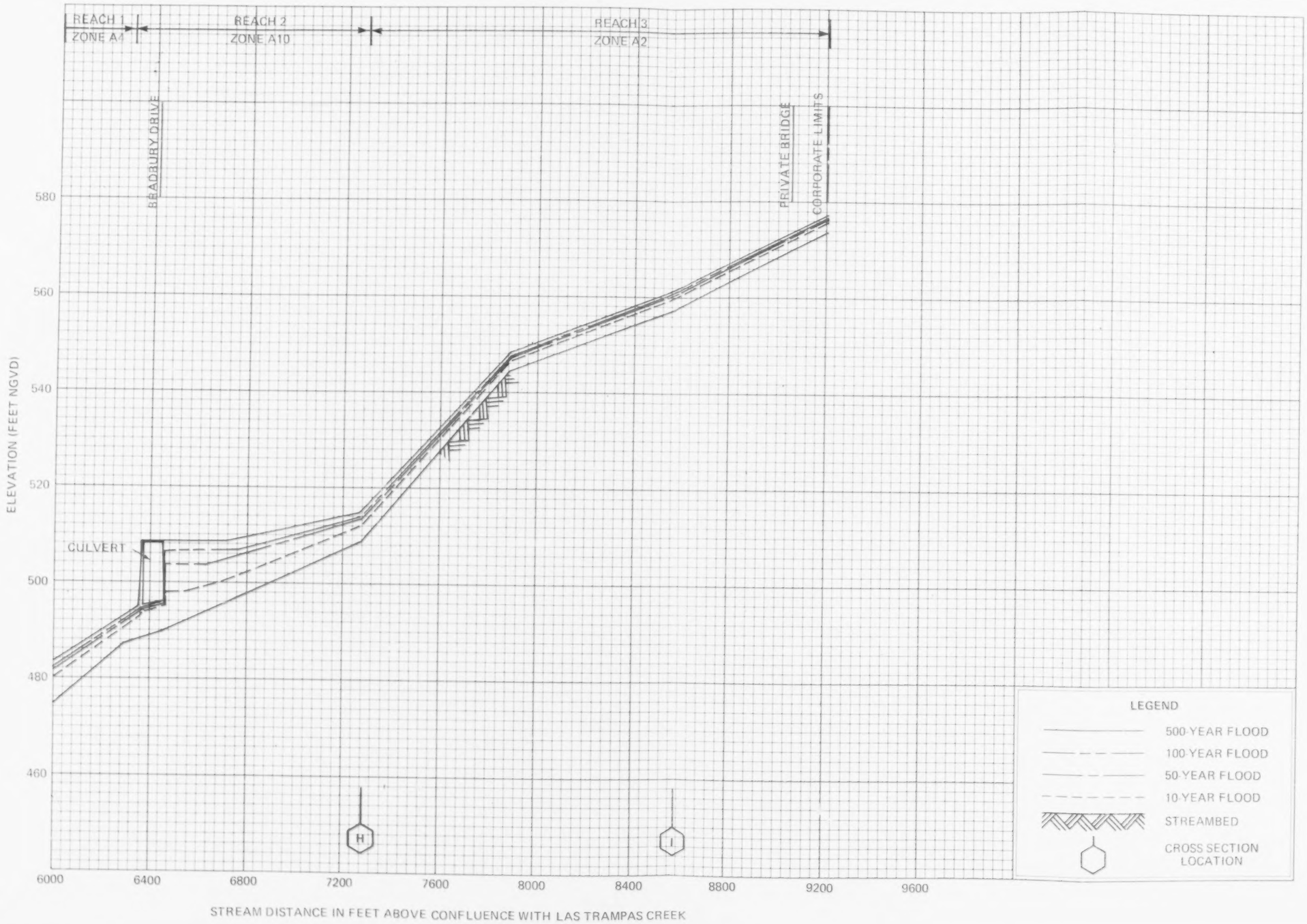
24P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

FLOOD PROFILES

GRIZZLY CREEK



FLOOD PROFILES

GRIZZLY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF LAFAYETTE, CA
(CONTRA COSTA CO.)

25P